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During this month the roadmasters' will hold their annual convention in St. Louis. In October the master painters' and the bridge and building men will meet at Detroit and Atlanta, respectively. For the last two years these meetings have been unusually well attended, largely as a result of the support extended by the Railroad Administration. This encouragement will be absent this year except in so far as the individual roads extend it. It is to be hoped that the managements of the roads will realize the benefits which will accrue to these roads from the attendance and the participation in these meetings of their interested officers. However, the supervisors should not wait for their supervisors to take the initiative, but should make their plans at once to be present at the meetings of their respective organizations. They owe it to themselves and to their roads to avail themselves of the opportunity to acquire information concerning their work, for the roads are now entering a period of reconstruction in which the pressure for efficiency will be more intensive than ever before.

Plan to Be Present

It would be impossible to devise any scheme for increasing the compensation of railroad employees which would not result in some inequalities between the various classes and grades of employees. The recent wage award is no exception to this rule. General advances in wages to the laborers, artisans and clerical forces naturally reduce the differential between employee and subordinate officer. In cases where the foreman is compelled to put in considerable overtime, his monthly pay check may be little if any below that of the assistant supervisor. In fact, at least one case has been brought to notice where an assistant supervisor has filed a request to return to his former position as foreman for this reason. However, this state of affairs should not be a source of discouragement to the supervisory forces. No executive ever suffered any harm through increased compensation to his subordinates. The principles of management demand an appreciable differential in favor of the superior, and while adjustment may be slow in coming, it is sure to take place. A number of roads are already at work on plans for readjusting the salaries of supervisors and higher officers in order that this differential may be properly maintained.

Inequalities of the Wage Advances

Although maintenance forces are still in the midst of this season's activities, they are approaching the time when much of the work normally closes down for the winter. Many roads are now enjoying the unique experience of having their forces up to or above normal. In many localities the men are also of a better class than were available a few months ago. Confronted with this opportunity to build up a more efficient force, it is pertinent to inquire whether the roads are going to take full advantage of it. In other words, will they endeavor so to revise their practices as to correct those conditions which have tended to drive men elsewhere at the first opportunity or will they interpret the present easing of the labor market as a permanent condition which requires no further consideration? Now is the

How About Permanent Forces?

time to give this problem mature deliberation. Within a few weeks, pressure will be brought to bear to reduce forces to the minimum or winter basis. The easy course to pursue is to accede to this pressure. However, the roads require efficient workmen now as never before, and efficiency is not promoted by accelerating the labor turnover or by laying off experienced men with the expectation of replacing them with inexperienced forces in a short time. It requires a study of local conditions and methods to ascertain just what work can be done satisfactorily during the winter and in a manner to relieve the forces of that necessity the following summer. The Long Island has employed permanent forces for several years and has found that it pays. One or two other roads have found that a considerable amount of maintenance work can be done equally well in the winter and by doing it at that time they have not only provided permanent employment for a larger proportion of their men and thereby had experienced forces available in the spring, but they have been able to retain more efficient men. Now is the time to begin a study of this plan to determine the extent to which the work may be rearranged satisfactorily in order to secure the economy which results from the employment of permanent all-the-year-round men.

MAKING IT PAY

SOME RAILWAY officers seem to think that any labor-saving device, once it has been established in service with even the most perfunctory demonstration to the men, will immediately begin to pay dividends on its purchase price. It is not surprising, therefore, that they begin to register surprise, disappointment and even disgust when they find that their expectations are not being realized. Any piece of equipment, no matter how well established its merits may be, requires three primary requisites for its successful use. It must be operated correctly and effectively, it must be used whenever it can be of economical service and it must be kept in repair. When a new device is being introduced, the manufacturer will frequently take it upon himself to see that these conditions are fulfilled, but the expense of such supervision comes under the head of development cost and cannot be considered as anything but an introductory measure of short duration. Eventually, therefore, the responsibility for the proper utilization of any equipment is strictly up to the railway officers themselves.

Because of the interest which supervisory officers of the maintenance of way department are displaying in all forms of labor-saving equipment, it is to be presumed that they will take enough interest in any device placed in their territories to exert every effort for its success. With the foremen the matter is not so clear. The new device implies greater responsibility on his part, both for the care of the equipment and its successful performance. In other words, more will be expected of him and it can be said in truth that the sooner the machine is abandoned the less he will have to worry about. This statement, of course, does not apply to the man with sufficient foresight to see beyond his present position and perceive that his capacity for increased responsibility places him in line for something better. Nevertheless, this is an attitude of mind which must not be overlooked.

Next to be considered is the man behind the gun—the one who, in the end, must be depended upon for the performance. Although the labor-saving device reduces the number of men required to perform a given amount of work and, in most cases, requires less arduous physical labor on the part of the operator, it does entail more alert action of the mind. The man must be "on the job" to see that the machine is working properly, to detect any defects before damage can be done and to see that it is kept going constantly. The typical common laborer finds it much more to his own comfort to keep droning along with a minimum of mental effort, even though he is compelled to put in more work with his back and his muscles. In the case of the skilled or semi-skilled workman, the situation is not so acute. No doubt carpenters do not have to be urged to use the power saw in place of the hand tool. On the other hand, many painters prefer to use a hand brush than to bother with a spraying outfit.

How, then, is the work to be handled so as to obtain the proper performance of the machine? The first step is to introduce it first in the gang where the foreman is more than usually energetic, ambitious and intelligent. Similarly, it is essential to select the most likely workmen in the gang. But is that enough? One answer comes from an officer who says that "All the men assigned to machine work immediately want a raise in pay." This suggestion has the merit that a differential in pay would in some measure provide an incentive for efficient operation. Men assigned to a pneumatic tamper at an increased rate would, no doubt, make increased efforts to hold their jobs. Another suggestion comes from a student of labor-saving equipment who proposes a bonus for performance as the most effective plan of obtaining the greatest possible use of the equipment. In view of the fact that two eastern roads followed this system extensively before the government control period, this plan seems to hold considerable merit.

Suggestions like the two above cannot be put into practice without the most careful study. They must be considered from all angles. But the obstacles encountered in this or any other plan undertaken to increase the effective use of labor-saving devices should not be a deterrent to carrying them to completion. There is no question but that the use of labor-saving equipment in the maintenance of way department will be applied eventually to a large portion of the many detailed operations to be performed and the sooner that defective practices which are now leading to difficulties in some cases are eliminated, the sooner will the roads reap the benefits to be derived from the equipment placed at their disposal.

A Nickel a Day

If each of the two million employees in railway service, from the water boy on the extra gang to the highest executive, saves five cents for his road each day, by greater and more intelligent effort; by greater care of plant, materials and fuel; by the elimination of waste; or by the adoption of improved methods—the total saving in a year of 300 working days will be $30,000,000 or enough to buy 400 locomotives, 10,000 freight cars or 600,000 tons of rail. Or suppose that each of the 500,000 maintenance of way employees saves five cents a day in this way, this alone will aggregate $7,500,000 in a year, or enough to buy over 5,000,000 ties.

ARE WE FACING A SHORTAGE OF TIES?

THE TIE Committee of the American Railway Engineering Association has made a valuable contribution to the literature on the subject of substitute ties in its report to the American Railroad Association which is abstracted on another page. Maintenance men have been confronted with alarming reports of the impending depletion of the supply of timber for crossties for many years. The regularity with which these rumors have appeared has caused many to feel that early resort to other materials than wood is inevitable. The report referred to will do much to allay these fears, for it points out that sufficient timber is available for ties at the present time and further expresses its belief that the transition from timber to some other material will be brought about gradually by conditions of economy rather than of absolute depletion of supply.

In considering the necessity for the use of other materials than timber for ties, one is immediately confronted with the fact that the roads as a whole are not making the best possible uses of the timber now at their command. The crosstie requirements of the steam railways of the country are somewhat in excess of 100,000,000 annually, an average life of from seven to nine years being secured. In contrast with this service period, the Santa Fe is securing an average life in excess of 15 years from an inferior grade of timber. The fact that this road is able to secure from its timber approximately twice the average life obtained by the roads of the country as a whole is due to the fact that all of the ties are subjected to preservative treatment and tie plates and other means of protection from mechanical destruction are used liberally. In view of the fact that less than 35 per cent of the ties used today are treated, in the face of the demonstrated advantages of treatment, it will appear self-evident that the first step in the solution of the problem of securing an adequate tie supply is to reduce the requirements by protection from decay and mechanical wear. If the roads of the country would adopt the practice of treating their ties universally with the proper preservative and then of protecting them against unnecessary mechanical injury, there is no reason why the average life of the ties of the country cannot be increased to 15 years, so that the annual renewals would be cut almost in half.

However, as the committee points out, even with the most careful use of the ties, it is probable that the time will come when the roads will find it economical to go to the use of other materials. As the committee points out, no tie has yet been developed which meets all of the requirements satisfactorily. It is, therefore, important that the roads lend encouragement to experimentation in order that some form of substitute ties may have been brought through the period of development to that of practical production when the time does come that the roads find it desirable to resort to their use. Sane judgment, therefore, recommends that the roads will find it economical to continue the use of wooden crossties for some years to come, protecting them with preservatives, tie plates, etc., and at the same time preparing for the day when economical considerations may make other forms of construction desirable.

ELECTRIFICATION IN JAPAN.—The government of Japan would invest 50,000,000 yen in a semi-governmental electric-power company, according to the provisions of the bill introduced in the Japanese Diet for the complete electrification of the railways of Japan. This company would be capitalized at 100,000,000 yen, the other half of the capital stock to be subscribed by Japanese citizens or bodies incorporated under the laws of Japan. Any surplus power would be disposed of to private concerns.

LETTERS TO THE EDITOR

IMPROVING THE VIEW AT GRADE CROSSINGS

Greenville, Pa.

TO THE EDITOR:

I was very much interested in the editorial in your August issue entitled "More Attention to Highway Crossings." I am entirely in sympathy with the spirit of this editorial. In addition to the feature which you have emphasized I think there is still another important feature in connection with the maintaining of grade crossings. The legal obligation to the traveler to "Stop, Look and Listen" is still on the statute books, but we all know that since the advent of the automobile stopping and listening are dead letters, so that the only real protection that the traveler has is obtained through what he can see. Recognizing this as a fact, does it not lay a great obligation on the railroads to provide and maintain the very best conditions possible as to sight at each grade crossing? Frequently the line of sight is seriously obstructed by the growth of bushes and weeds, the failure to trim trees, the erection of billboards immediately adjacent to the crossing, and in some instances the unnecessary and uncalled for erection of a building, which might just as well be located at a point where it would not interfere so seriously with the line of sight.

An inspection on about 200 miles of main line on one road showed that at least half of the grade crossings could have the line of sight very materially improved at an expense that was trifling. I believe that the railroads could very profitably have their safety committees make motor car trips over their districts, stopping at each grade crossing to see whether the line of sight can be improved at that point, and I believe that such efforts will tend to cut down the number of grade crossing accidents, and will accomplish to a large extent what you have in mind, a better feeling between the public and the railway. I further believe that it would be entirely feasible in some instances for the railways to purchase land to protect the line of sight, and that if this matter is properly taken up with adjacent property owners their co-operation can be secured in many instances.

F. R. LAYNG,
Engineer of Track, Bessemer & Lake Erie.

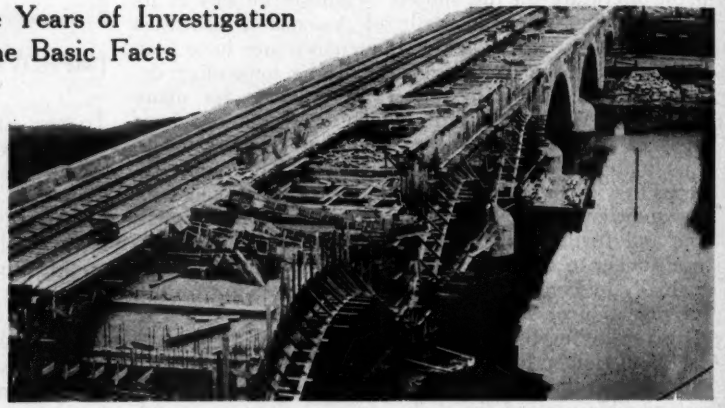
NEW BOOKS

Text Book of Materials of Engineering. By Herbert F. Moore, research professor of engineering materials, University of Illinois. 6 in. by 9 in., 315 pages, illustrated, bound in cloth. Published by the McGraw-Hill Book Company, 239 West Thirty-ninth street, New York.

This volume is intended primarily as a text book for students, but it will also serve as an up-to-date summary of the present progress in structural materials and their properties. The new edition contains an entirely rewritten chapter on concrete by Harrison F. Gonnerman which covers some of the more recent developments, such as the investigations by Abrams for the Portland Cement Association. A new chapter has also been added on rubber, leather belting and hemp rope. The opening chapters cover strains and stresses, and repeated stresses and working stresses, the latter containing summarized statements of the classes of materials used with various classes of structures and equipment, such as bridges, buildings, shafting, railway equipment, machinery, etc. Following this there are chapters on various materials.

RECENT ADVANCES IN CONCRETE PRACTICE

Results Obtained in Five Years of Investigation Reduced to the Basic Facts



IN 1914 THE Structural Materials Research Laboratory was established at Lewis Institute, Chicago, with Prof. Duff A. Abrams at its head, to undertake an extended course of investigation on all phases of concrete, this work being financed very largely by the Portland Cement Association. Since that time many thousands of tests have been made, the results of which have been reported from time to time in publications issued by the laboratory. In this way a great amount of valuable information has been disseminated which has done much to modify practices in the making of concrete. However, much of the information issued has been of such a highly technical character as to make it unavailable for those who have not given detailed study to this subject. It has remained, therefore, for Col. H. C. Boyden of the Portland Cement Association, to prepare a concise summary of this work, which he presented as a paper before the Duluth Engineers' Club on May 17, 1920. This outlines the new principles of practice in the simplest terms, and is abstracted below:

The study of concrete may be conveniently divided into three phases:

1. The study of the characteristics of the ingredients.
2. The study of the effect of making various combinations of these ingredients.
3. The study of the effect of the various manipulations of the ingredients in making and curing the concrete.

Although cement is one of the most important ingredients of concrete, it requires probably the least discussion, as all the standard brands of Portland Cement on the market today conform to generally accepted specifications and the laboratory investigations have brought out no essential changes in these specifications.

As stated above, the aggregate has always been divided into two parts, sand and crushed stone or pebbles. The line of division, purely an arbitrary one, has been the quarter-inch screen; the portion passing through this screen has been classified as fine aggregate or sand, and that portion retained on the screen being called the coarse aggregate. There is no particular advantage gained by this division, but it would be much better to consider the aggregate as a whole with a proper gradation of the various sizes from the largest to the smallest. It is not intended by this, however, to recommend the use of bank run or crusher run aggregate, as under no conditions should they be used without separating the sizes and recombining in the proper proportions.

Fine Aggregate

We have been accustomed to specify that the fine aggregate shall be clean, sharp and not too fine. It would be better to use the word hard rather than sharp, as sharp sands give lower results than rounded or smooth sands. This is no doubt due to the larger amount of water required to obtain a workable mix when the sand is sharp or angular.

The laboratory studies have brought out two important facts regarding sands. One of these is the great importance of being sure that the material is clean, not only in appearance, but in fact. Very often sand which appears to the eye to be clean, contains enough humus or vegetable matter to reduce the strength of the concrete very considerably.

As an illustration, a clean sand gave a compressive strength at 28 days of 1,900 lb. per sq. in. This same sand with 0.1 per cent of tannic acid added, gave a strength of only 1,400 lb.; in other words, one thousandth part of organic impurities in terms of the weight of the sand reduced the strength of the concrete nearly 25 per cent.

How can we detect these organic impurities if we cannot see them by ordinary inspection? By using the colorimetric test for organic impurities devised at the laboratory. This test consists of digesting a representative sample of the sand in a dilute solution of sodium hydroxide (caustic soda = NaOH) and observing the resulting color of the liquid.

All that is needed is a 12-oz. prescription bottle and a little 3 per cent solution of caustic soda or sodium hydroxide, both obtainable at any drug store. Put in about 4½ oz. of the sand to be tested, fill up to the 7-oz. mark, after shaking, with the solution of caustic soda, let it stand for 24 hr. and observe the liquid on top. If this liquid is clear or light straw colored use the sand; if it runs into the brown color and especially dark brown, reject the sand or wash it thoroughly before using.

The second fact is that fine sand behaves exactly the same as coarse sand with one exception. In order to produce a plastic workable mixture with fine sand it is necessary to use more water than with a coarse sand. It is the excess of water that reduces the strength of the concrete. In other words, if we could mix our concrete with the same quantity of water regardless of the grading of the sand, and obtain a plastic mix in both cases, we would secure the same strength in the concrete.

Coarse Aggregate

When studying the characteristics of the coarse aggregate one conclusion has been brought out very sharply, namely, that the hardness of the aggregate is a secondary consideration as compared with other factors in developing high crushing strength in concrete, and of less importance than ordinarily supposed in developing wearing qualities. This was very clearly shown in comparative tests made of burnt shale for use in building concrete ships. Samples made with this aggregate compared very favorably with those made up using a much harder aggregate. A stone must be very friable, indeed, if it is not strong enough when properly combined in concrete, to more than maintain the load likely to be carried by the concrete.

The reason for high compressive results given where a light, soft aggregate is used is because the water content is reduced, owing to the porosity of the aggregate and not due to a higher compressive strength in the aggregate. Again we find the water content to be the governing factor.

It is not intended in calling attention to the above results to advise throwing down the bars and allowing the use of any and all stones, irrespective of their hardness or wearing qualities. It is desired, however, to show that many of the safeguards we have been putting into specifications in past years are not safeguards at all, but that the effect of following them may be entirely lost through neglect to observe other factors of more vital importance. It is always advisable to use the best materials obtainable, but there have been many cases, where the local and easily obtained material has been rejected, when it could have been used with excellent results, by following proper principles in proportioning and protecting the concrete.

Oftentimes better results would have been obtained than resulted from the use of imported materials and then neglecting the really important factors in making good concrete.

WATER

The remaining ingredient of concrete, water, is in reality of equal importance with the cement in obtaining good concrete, and yet it is often the most carelessly used and most loosely specified of all the ingredients, generally not mentioned in specifications and frequently not even reported in test data.

The laboratory is now conducting tests of waters sent in from all parts of the country, but definite conclusions have not as yet been developed. It is safe to say, however, that waters which are strongly alkaline should not be used and, owing to the possibility that marsh waters may contain sufficient humus matter to seriously affect the strength of concrete, they should be looked upon with suspicion until tested in concrete and found satisfactory.

With regards to the temperature of the mixing water, tests have been made, using water ranging in temperature from 32 to 212 deg. F. It was found that the temperature of the mixing water had very little to do with the strength of the concrete at seven days to one year. The use of hot water is, however, a valuable aid in removing frost from the aggregate in cold weather owing to its high specific heat and may be used without danger of harming the concrete.

PROPORTIONING

It is on studying the second phase of concrete making that there have been brought out at the laboratory new, and in some ways radical, changes in the past and present practices of proportioning.

These investigations have brought out the following facts: That the present method of designing concrete mixtures by using arbitrary volumes is wrong, that there is one single proportion which will give the best results with a certain mixture of given fine and coarse aggregates. Adding to or reducing the amount of cement is of value only as it affects the amount of water required to make a workable plastic mixture and, above all, that the water-ratio is the most important element of a concrete mix. The water-ratio is the ratio of volume of water to the volume of cement in the batch. If 1 cubic foot of water (7.5 gals.) is used for each sack of cement, the water-ratio is 1.00.

The use of more cement in a batch does not produce any beneficial effect except from the fact that a plastic, workable mix can be produced with a lower water-ratio. The reason that a rich mixture gives a higher strength than a leaner one is not that more cement is used, but because the concrete can be mixed with a water-ratio which is relatively lower for the richer mixture than for the lean one. If advantage is not taken of this possibility of reducing the water-ratio the additional cement in the richer mixture is wasted.

It is upon studying the water content that we find the most radical change from our previous ideas on the design of concrete mixtures.

Based upon thousands of tests, it has been established that there is a direct connection between the amount of mixing water used and the strength of the concrete and there is probably no other one factor which has so great an effect upon the strength as the water content.

It has been found that the less water used down to a certain point, the stronger will be the concrete; but this deos not mean that we can go too far in reducing the amount of water, nor can we in actual construction reduce it to a point that would give the maximum strength shown in laboratory tests. There is another factor that must be taken into account in construction and that is the workability of the mix, so in general terms we can say that the lowest amount of water should be used that will give a workable mix.

The strength falls off very quickly with the addition of a small amount of water; so much so that in a one-bag batch the addition of one pint of water more than is necessary to give a workable mix produces the same loss in strength as if we had left out two or three pounds of cement. Do not think from this that we can use a very lean mix with a small amount of water and obtain as strong a concrete as a rich mix with the same amount of water. This is not true, because it will require a higher water-ratio to produce a workable mix with the lean mixture, thereby causing a loss in strength.

The very wet, sloppy mixtures that are being used in building construction may seem economical from the contractors' point of view, but they are certainly extremely wasteful from the designers' and owners' point of view, as from 50 to 60 per cent of the possible strength of the concrete is being thrown away.

It may not be possible to reduce the amount of the water to the ratio necessary to give the maximum strength, but it certainly can be cut down below the amount commonly used, and the additional strength thus gained taken advantage of in the design of concrete structures.

It is not possible to give the exact amount of water required for any particular mixture of aggregates to give the greatest strength in the concrete, owing to the impossibility of determining what amount will produce a workable mix and also due to the varying moisture content of the aggregate. A few approximate quantities for different proportions of well graded aggregates up to 1½ in. in size, may be given to form a basis for trial of the particular mixture at hand.

A 1:2:4 mixture will require from 6 to 6½ gal. of water per sack of cement, a 1:2:3 mix, 5¾ to 6¼ gal., and a 1:1½:3 mix, 5½ to 6 gal.

MANIPULATION OF INGREDIENTS

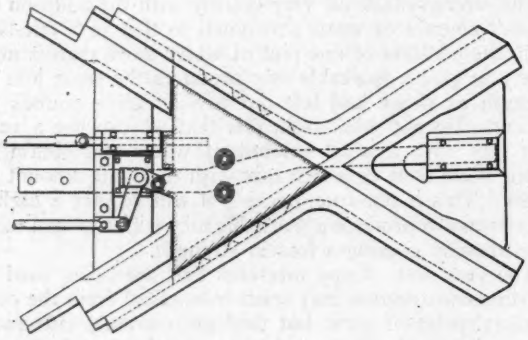
In considering the final step, the manipulation of the ingredients during the making of the concrete, careful studies have been made of each operation. The time of mixing is a matter of importance in obtaining good concrete and one that vitally effects the output of the mixer and consequently the cost. Exhaustive tests made on concrete mixed in a batch mixer from 15 sec. to 10 min. show a rapid increase in strength for the first minute, after which the increase is less pronounced as the time of mixing increases.

This shows the necessity of mixing the concrete at least 60 sec. and not 20 to 40 sec. only, as is often done. There is no question as to the advisability of using a batch meter on the mixer, provided one can be found that cannot be tampered with, in order to avoid controversy over the time of mixing and to insure a full minute mix. When a mixer is manufactured that will not permit discharge until a certain number of revolutions have been made at a certain speed this problem will have been solved.

The revolutions per minute of the mixer within the limits of 12 to 25 r. p. m. have but very little effect on the strength of the concrete, so that a sufficiently wide variation for different machines is permitted.

EXTENSIVE IMPROVEMENTS TO THE EYMON CONTINUOUS RAIL CROSSING

RECENT IMPROVEMENTS made in the Eymon continuous rail crossing have added greatly to the adaptability of that construction to the various classes of service encountered at railroad crossings, particularly with respect to meeting the requirements of signals and interlocking. The Eymon crossing was invented in 1908



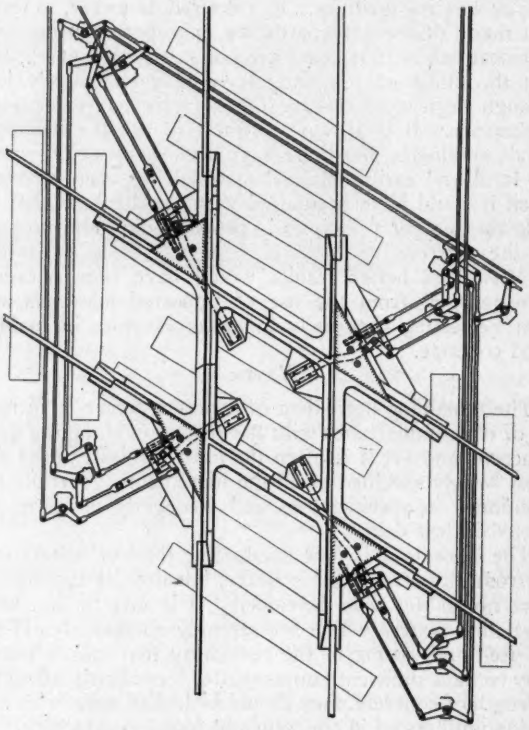
A Large Scale View of the Movable Block

and has been in service for the past six years at a number of railroad crossings in this country. The principal feature of these crossings is four triangular blocks of steel designed to fit into the exterior angles of the four corners of the crossing and arranged to slide in a direction perpendicular to a line bisecting the angle of a corner, so that either one or the other flangeway is closed. Thus a continuous rail may be provided for either track at will.

Service tests on crossings of this design since 1914 have demonstrated that the idea is correct in principle and that the design is also thoroughly practicable. They also pointed to the desirability of developments that would facilitate the installation of these crossings at interlocking plants so that the movements of the blocks would be under the same control as the points of switches or the movable point frogs of slip switches.

These modifications have since been carried out with the result that certain advantages have been secured which constitute definite improvements over the original designs. The blocks have been made larger so that they now have a length of 28 in. on the running rail edge. They are made of solid manganese steel castings of special composition and are incorporated in manganese steel crossing construction, not unlike that now standardized for the regular open flangeway crossings. Another improvement has been to place all the operating rods entirely outside of the diamond of the crossing, so that there are no parts to be caught by dragging brake rigging, etc. Small aperatures have also been introduced in the flangeways of the crossing so that any snow, dirt, etc., is readily cleared out of the flangeway each time that the movable blocks are shifted.

Another important feature in the modification has been to place the connections to the operating rods on the under side so that the body of the block is solid and free from any obstructions or openings other than two holes for the bolts by which the bar socket is attached to the block. With these bolts removed, the movable block may be



General Plan of an Eymon Crossing as Arranged for Control from an Interlocking Tower

lifted clear for inspection or replacement without disturbing any other part of the structure. The bolts used for this purpose are ordinary track bolts.

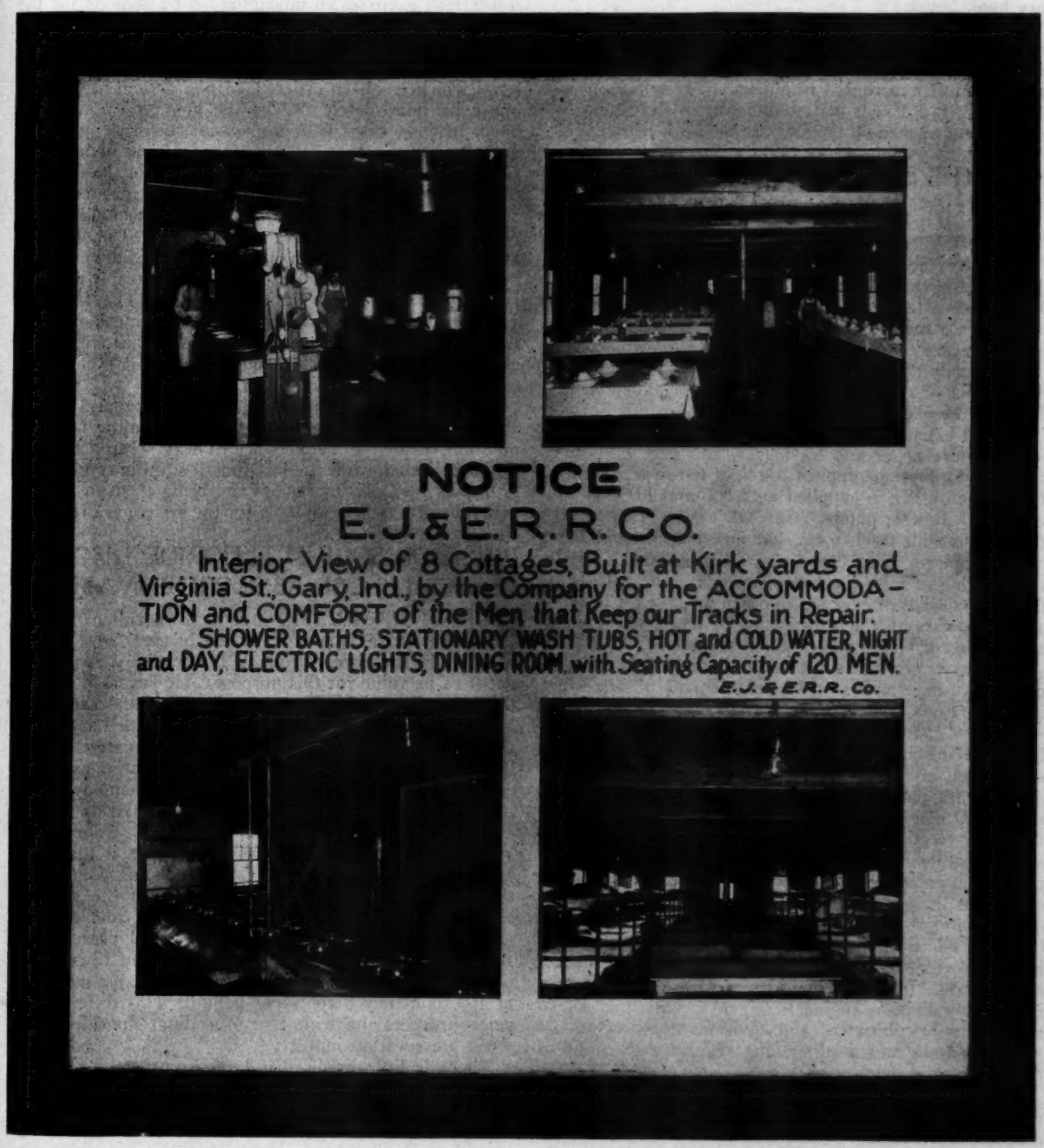
Perhaps one of the most important gains resulting from the redesign comes from the facility afforded for making signal connections. Suitable lugs have been provided on the back of the movable block for a connection to a bell crank connected in turn either with mechanical bolt locking or suitable electric locking, as required by accepted standards of signaling. In addition, the arrangement for a plunger lock has been modified so that only one plunger is required, instead of two as in the old design, and this plunger has an eight-inch throw corresponding to standard practice for facing point switches, movable frogs and slip switches, etc.

These improvements, together with the basic features of the continuous rail crossing, effect some very definite advantages for this class of construction which have been enumerated by the manufacturers as follows: (1) The elimination of the necessity for a special foundation since the service is practically no more severe than that of standard track; (2) it is adapted to the use of four-piece solid cast manganese construction; (3) it insures longer life than open flangeway crossings and lower costs for maintenance and renewals; (4) it is simple to install. These crossings are manufactured by the Eymon Crossing Company, Marion, Ohio.

PUBLICITY FOR MODEL CAMP ATTRACTS LABORERS

THE COLUMNS of this journal have frequently presented detailed accounts of excellent camps constructed and maintained by the railroads to provide adequate and comfortable accommodations for the men in the floating gangs or who for any other reason must be housed and fed by their employers. The movement toward improved housing facilities has been brought about through a realization on the part of the railroads that the money so spent would be returned manifold in the better condition of the men in body and spirit, reflected in turn in increased output of work and reduced labor turnover.

In general the railroads have enjoyed the advantages of such an arrangement only as regards its influence on the men who were induced to enter these camps and except as a knowledge of the better camps is noised about through the aid of the "grapevine" telegraph, the roads have obtained no particular advantage from their efforts made to provide good camps in so far as concerned the recruiting of the men. It has remained for R. W. Nicol, supervisor of labor on the Elgin, Joliet & Eastern, to hit upon a plan for capitalizing the merits of that company's camp in the Kirk yard at Gary, Ind., in attracting men to employment. Instead of leaving it entirely to the labor solicitors to comment on the quality of the camp, he conceived the idea of presenting a visual demonstration in the form of actual photographs of the camp's interior. A


NOTICE
E.J.&E.R.R.Co.
Interior View of 8 Cottages, Built at Kirk yards and Virginia St., Gary, Ind., by the Company for the ACCOMMODATION and COMFORT of the Men that Keep our Tracks in Repair.
SHOWER BATHS, STATIONARY WASH TUBS, HOT and COLD WATER, NIGHT and DAY, ELECTRIC LIGHTS, DINING ROOM with Seating Capacity of 120 MEN.
E.J.&E.R.R. Co.

Picture in Labor Agent's Window Advertises a First-Class Camp

group of four neatly-framed pictures was placed in the window of the railroad's labor office on South Canal street, Chicago, as shown in the illustration, with a lettered notice drawing particular attention to the advantages of the camp. The pictures were selected with a view to illustrating those features of the camp in which the men would be most interested, namely, a neat kitchen, an inviting mess hall, a sanitary lavatory and a light and airy bunk house.

The supply of labor on a given piece of work is governed by a number of factors. Consequently, it is difficult to base any definite conclusion on the results obtained by this experiment in publicity. It suffices to say that the E. J. & E. has had no difficulty in securing a full complement of men on the work at the Kirk yard.

HOW THE SOUTHERN PACIFIC HANDLES SUPPLY TRAINS*

THE NUMBER of trains in this service on the Southern Pacific total four and they are operated from the Los Angeles, Cal., and Sacramento general stores. They cover a territory of approximately 5,175 miles and operate on a regular schedule every 30 days on the main line and every 60 days on the less important branches.

The supply train itself consists of from 17 to 25 cars, the number of cars depending upon the territory served. Five of these cars are specially fitted for this service. Car No. 1 is equipped with a desk and bunks for the supply car storekeeper and his helper, and also with racks and bins for station supplies and light hardware, etc. Car No. 2, the oil car, is supplied with 500 and 1,000 gal. oil tanks with Bowser pumps. Car No. 3 is fitted with racks for carrying all track tools, handles, brooms and other bulky supplies. Cars No. 4 and 5 are equipped for the transporting of miscellaneous materials. The balance of the train consists of carloads of other supplies for delivery and of flat cars for the transporting of scrap, second-hand and surplus materials picked up on the line.

The classes of materials handled by the supply train include all of the supplies used in maintenance of way work, including frogs, switch points, switch stands, joints, bolts, spikes, etc. In addition, l. c. l. lots of lumber, push, hand and velocipede cars, warehouse and baggage trucks, mail carts, crossing and right-of-way signs, drums of distillate for pumping plants, and of gasoline for section and signal maintainers' headquarters, lime and soda ash for water treating plants, coal, ice, oils to be used in the signal, maintenance of way and bridge and building departments, pumping plants and station agencies, and miscellaneous material are carried on this train. The value of the material handled monthly is approximately $140,000. In addition, approximately 3,000 tons of second-hand and scrap materials are picked up monthly by the supply train. In a large majority of cases division superintendents, division engineers, signal or assistant signal supervisors, roadmasters and division storekeepers use this train as a means of making regular inspections of their respective territories.

Requisitions, totaling approximately 7,200 monthly, are usually made up by the roadmaster and sent direct to the division storekeeper, who inspects them and forwards them to the general store from which the supply train operates. It is not considered necessary to have the superintendent and division engineer's approval on these requisitions, inasmuch as both of the latter usually accompany the supply train and the materials furnished may be investigated on the ground.

On account of the supply trains being on the road practically the entire month, a supply train clerk has been established at the two general stores from which the trains operate and when requisitions are received at these points they are registered and turned over to this clerk, who prepares a summary of all material called for on the requisitions, and arranges for its assembly so that when supply trains arrive for loading there is little delay.

Previous to starting each day's work, the supply car storekeeper prepares an unloading list by stations for the day. Between stations the division storekeeper checks his copy of the unloading list and determines the number and class of tools, etc., to be exchanged, as well as the material which has been ordered. Upon arrival at the tool house he immediately checks the amount of stock on hand, in most cases with the roadmaster and quite frequently with the division superintendent and division engineer. It is then determined whether or not the quantity ordered is over or above what is actually needed for a 30-day period or if the amount ordered should be increased. In either case the material decided upon is delivered and the requisition is changed accordingly.

The exchange of tools and other exchangeable material is watched very closely in this manner. The fact that everything that can be exchanged is exchanged, without doubt saves considerable money to the railroad, as it eliminates abuses, losses through theft and other practices which have been costly in the past.

One other function performed by the supply train is the distribution of illuminating and lubricating oils. In addition, all of the maintenance of way scrap accumulation is collected, while the last function of the supply train is to pick up tools for repairs and bring them to the two general stores, where all tools for the system are repaired.

*Abstracted from an address given before the Pacific Railway Club by A. S. McKelligon, general storekeeper, Southern Pacific, San Francisco.

PRICE OF SODIUM FLUORIDE DISCOURAGES ITS USE AS A PRESERVATIVE

THE DESIRABILITY of sodium fluoride as a wood preservative is practically established for the data collected by the Forest Products Laboratory is strong evidence of its value for this purpose. However, in spite of this fact, George M. Hunt, in charge of the section of Wood Preservation of the Forest Products Laboratory, Madison, Wis., has pointed out that this material is not being used to any extent as a wood preservative except by one large coal mining company which has employed it in preference to coal-tar creosote or zinc chloride for the treatment of its mine timbers since 1915. While other companies have expressed their interest in it they have never used it in quantities. Mr. Hunt has pointed out that the reason for this is obvious when the price of sodium fluoride is compared with that of zinc chloride, which is the standard water-soluble wood preservative. At present sodium fluoride is selling at about 15 cents per pound, while zinc chloride is purchased in large quantities at approximately 8 cents per pound. This difference in price prevents the wide use of sodium fluoride in the wood-preservation industry.

There is little doubt that large contracts for sodium fluoride would be placed if the purchaser could be assured of a price equal to or less than that of zinc chloride, although if sodium fluoride should begin to compete sharply with zinc chloride, the price of the latter would probably fall. Lowering prices of these two preservatives would encourage treatment and result in a larger volume of treated timber. The question as to whether it is possible to manufacture sodium fluoride at a price low enough to compete with zinc chloride was recently investigated and it was concluded that there is no apparent possibility of manufacturing it very cheaply under present conditions.

A. R. A. COMMITTEE REPORTS ON SUBSTITUTE TIES*

Exhaustive Study Shows No Immediate Necessity for Concrete or Metal Construction

FOR MANY years efforts have been made to introduce substitute ties, the first ties being made of metal, then of concrete, and finally of combinations of steel, wood and concrete. In Europe steel ties were introduced very early and a few types were rather extensively tried. However, relatively, the substitute tie has only had a limited use and where it has been used to more than a limited extent it has been under special conditions. For instance, the more extensive use in Germany was due to a desire to provide a market for the surplus product of the steel mills.

The wheel loads and traffic conditions on European roads are such that results obtained are no criterion as to what would be secured under American traffic and it is safe to conclude that, while much may be learned from European experience, no substitute tie has been developed there which would promise success in this country. The same may also be said as to the ties which have been and are now in use in Mexico, South America, Africa, Australia and India, in all of which countries the requirements fall short of those of roads in the United States and Canada.

The first trial of substitute ties in the United States, of which the committee has knowledge, was made in 1878. Since that time a large number of types have been tried, the majority of which have been tested only in small quantities. Many of these, especially in recent years, seem to have been designed by persons having slight knowledge of the fundamental requirements and were evidently put in track at the solicitation of the inventor rather than because of any serious purpose on the part of the railroad to develop a practical substitute.

The only substitute that has been manufactured on a commercial scale, and used extensively, is the Carnegie Steel Company steel tie of I-beam section, of which approximately 1,250,000 have been put in steam railway track, and of these approximately 1,200,000 have been used on roads affiliated with the United States Steel Corporation, notably on the Bessemer & Lake Erie, which has purchased 1,142,000 steel ties of this kind.

There are several designs, especially of the composite type, that is, of steel and concrete, and steel and wood, which promise to develop into successful substitutes, but their use has been so limited that definite conclusions cannot be drawn at this time.

The results obtained with the steel I-beam tie up to the present are covered in the following statements:

(*a*) *The steel I-beam tie has proved to be a practical substitute for the wood tie on non-insulated track under heavy and dense traffic.*

(*b*) *Line surface and gage have been maintained on such track at reasonable expense.*

(*c*) *No satisfactory method of insulating the I-beam tie has been developed.*

(*d*) *Corrosion is a serious factor in limiting the life of the tie, and means of protection should be provided.*

(*e*) *Because of the lack of definite information as to the average life of steel ties, sufficient data are not available to make satisfactory comparisons of annual cost as between steel ties and wooden ties.*

This committee is of the opinion that a substitute tie should be developed for the following reasons:

(a) The probability is that the cost of wooden ties will continue to increase. Sufficient timber for ties is available at the present time and it is possible that, with the more extended use of preservatives, better means of protecting the tie from mechanical wear, and by reforestation, the railroads can obtain their requirements indefinitely. It is believed that it will simply be a question of price as to whether the timber available is converted into ties or whether substitute ties are used instead. As it is probable that a satisfactory substitute tie will be the result of progressive development, rather than instantaneous design, and that such development will require a considerable period of years, during which the supply of timber will probably decrease, the railroads should take a more active part in the design and development of substitute ties.

(b) Efforts to lower the cost of maintaining track by reducing the amount of labor required.

CONCLUSIONS

1. No substitute tie has as yet been developed which can be recommended for general use on high-speed insulated track.

2. The development of substitute ties should be taken up by the railroads with a view of conserving the available timber supply—of producing a track structure of longer life—which may be maintained with less labor.

3. Any statements made to urge the introduction of a substitute tie on the claim that safe track cannot be maintained with wooden ties, such as will be available for some time to come, are without foundation and are contrary to the facts.

HISTORY OF SUBSTITUTE TIES

It is probably not generally known, even among railroad engineers, that attempts to produce satisfactory ties of metal date back over sixty years. A great many forms of substitute ties have been brought out, not only in foreign countries, where suitable tie timber has been less plentiful, but also in the United States.

The fact that no substitute tie has yet been developed which can compete, under ordinary conditions, on the total annual cost basis, with wooden ties has tended to make the whole subject of little more than academic interest to railroad managers. With a few notable exceptions, the railroad engineering departments in recent years have had to be content with seeing that each test was made under the most severe conditions as to traffic, and, with certain exceptions, there is little evidence of effort to *develop* a rational substitute tie.

This attitude is no doubt partly due to the fact that a number of substitute ties have been handled by promoters in such a way as to at least give good reason for the idea that the companies backing them are more interested in selling stock than ties. It has been the experience that a number of substitute ties while under trial for the first six or eight years have given great promise of meeting the requirements, and have been very highly spoken of by those interested in them, only to fail and require complete removal from the track in less than ten or twelve years, or in less than the average life of properly treated wooden ties.

The standing timber in the United States totals 3,000 billion board feet. It is being cut at the rate of 100 billion board feet per year. It is growing at the rate of 35

*Abstract of a report made by the Committee on Ties to the American Railroad Association, published in Bulletin 227 of the American Railway Engineering Association.

billion board feet per year. It is being destroyed by fire, insects, decay and waste at the rate of 35 billion board feet per year. Thus the growth and the destruction counterbalance each other. Therefore, 30 years is the extent of the supply if the assumption is maintained that consumption will continue at the rate of 100 billion and destruction at the rate of 35 billion. The decline in the consumption of sawed lumber from 45 to 35 billion during the past 15 years is a permanent tendency marking the usual industrial development from free, wasteful use of a plentiful, cheap commodity to a conservative utilization as that commodity increases in value through being less available. Consequently, less than 100 billion board feet will be used in the future. The unaided natural growth of 35 billion board feet will be increased because forest products will

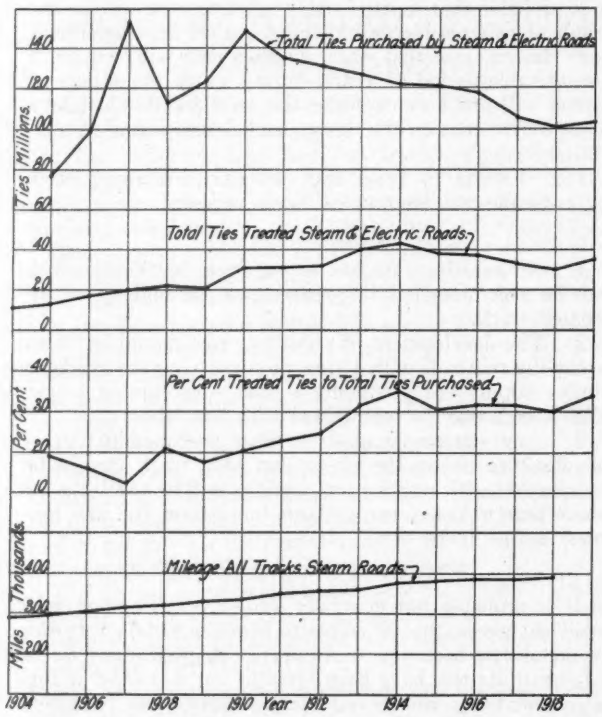


Diagram Showing the Relation of the Use of Treated Ties to the Total Number of Ties Purchased

become worth the cost of growing them. The destruction by fire will be reduced from the present 10 billion board feet because the consequent financial loss will not be tolerated. These factors will make the present supply and the new growth last at least 50 years.

Cross-ties constitute less than 5 billion board feet per year of the United States forest consumption. They can be made from every kind of tree represented in the estimates of standing timber. Consequently, wood for cross-ties will be available as long as it can be purchased. Since woods of certain kinds and sizes will not be available in satisfactory quantities and qualities for certain other purposes before they cease to be available for cross-ties, it is a safe assumption that wooden cross-ties can be had for well over 50 years.

The general figures for the United States do not, of course, represent conditions everywhere in the country. A railroad cannot move to the source of its wood supply, as may be done by a manufactory. Consequently, some railroads which began operations in a forested territory have had to go as far for some of their ties as railroads which operate through prairie areas. Railroads have gone long distances for ties because they considered their local supplies insufficient. Seldom have they pushed local production to the utmost. Through preferences for particular woods they have ignored other possible kinds.

Woods which are in special demand are the first to become scarce, as, for example, white pine and black walnut. It is because some railroads persist in preferring certain woods that are becoming scarce to the exclusion of others that color is lent to the tale that cross-ties are not to be had. A full utilization of the available supply of timber will provide sufficient cross-ties for at least 50 years, since none of the kinds of wood included in the estimates of supply are unsuited for use as cross-ties.

BETTER USE OF THE WOODEN TIE

Fortunately, wood has been chemically treated so as to enable it to last longer than it has been possible to protect it from mechanical destruction, which is now the limiting feature of treated tie life. The protection against mechanical wear has contributed considerably to the average life of untreated ties. The further development of this protection will add additional life to treated ties. This makes of every piece of woodland in the country a potential source of tie supply.

The untreated ties put in the tracks of United States railroads average about 7 or 8 years in service. Under methods of treatment and protection now in use, these ties will give about 15 years' service. If the 100 million untreated ties used per year were thus conserved, the lessened consumption of 2 billion board feet of timber annually would contribute appreciably to reducing the drain on the forest resources of this country.

It is evident that instead of concerning themselves over the supply of ties, the railroads, through wise handling, should conserve those they use.

SUBSTITUTE TIE DESIGN

The committee in its investigation of various substitute ties has been impressed with the fact that many of them violate fundamental principles of track construction or maintenance. The experience with substitute ties, so far recorded, indicates the following features as being productive of failure: (1) Lack of efficient protection against corrosion; (2) failure of rail fastenings; (3) failure of insulation; (4) loss of beam strength due to weakening tie in vicinity of rail to accommodate rail fastening features; (5) use of sharp interior angles or square holes, from which cracks are developed; (6) lack of protection against derailed wheels; (7) design of base of tie such as to render tamping difficult or impossible and such as to make maintenance of proper surface of track impracticable; (8) design of tie such that track will not hold line, or such as to make lining of track impracticable; (9) lack of beam strength causing breakage on yielding roadbed; (10) lack of protection from abrasion from ballast in concrete ties.

It is believed that any track supported on ties will not remain permanently to *gage, surface* and *line* and that the labor operations necessary to restore it to gage, surface and line will have to be performed with more or less frequency. Therefore, any substitute tie should be designed as far as practicable to (a) resist the forces tending to disturb gage, surface and line, and (b) lend itself readily to the labor operations necessary to restore the track to its original position.

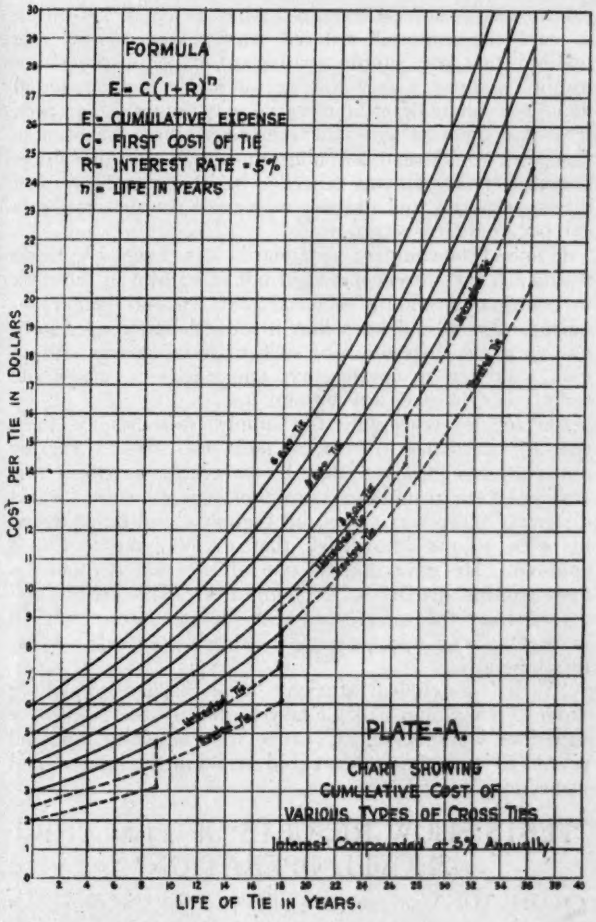
It is recognized that no tie can completely meet these requirements and that the most that can be expected is a compromise.

Gage—The fastenings, in addition to being of sufficient strength to resist the stresses produced by traffic, should be of such design that without taking the tie from the track and without change to the holes or fixed bolts or

projections in the tie, a reasonable change of width of base of rail or variation of gage may be made. The fastenings should provide a freeway between the base of rail and lip of the fastening.

If the tie is so designed that it is essentially one support under each rail united by a transverse member to hold gage, this transverse piece must be of sufficient strength to maintain gage under all conditions.

Surface—The tie should have sufficient strength as a beam to support the loads imposed without undue deflection, so that the load may be distributed properly over the tamped bed.



The shape of the base of the tie must be such that it will not cut into or destroy the tamped bed. And further, it must be possible to readily tamp the ballast under the tie.

Line—The tie should be of such shape that it will not only resist the tendency of track to get out of line, but also permit the track to be thrown back to line.

In addition to the above the following features should be provided for:

(c) Insulation or the possibility of insulation without a material change in the tie proper should be provided.

(d) The fastenings should be such as to offer as little obstruction to derailed wheels as possible. They should permit the changing of a defective rail or the renewal of rails with ease, and should be of such character that they can be replaced if broken or defective without disturbing the tie.

(e) The tie should be of such design as to be able to stand a reasonable amount of punishment from derailed cars.

RELATIVE COSTS

The subject of relative costs between wood and substitute ties must of necessity be limited to the application of known costs for comparison. A preliminary survey of available data at once indicates that there is very little information as to the present day cost of substitute ties. Therefore, it has been necessary, in preparing diagrams, first to establish cost curves of wood ties over a period of years, assuming a certain average life for untreated ties and another for treated ties. The various items of cost entering into these curves are merely assumed for the purpose of illustration.

It is conceded that these costs vary in different parts of the country due to varying factors, for example—kind of wood, length of haul, etc. The costs used are thought to be nearly the average. Inasmuch as known costs of substitute ties are unavailable, a comparison has been made by using a unit cost in place as compared to wood ties in place. No effort has been made to show the comparative effect of the cost of maintaining track where substitute ties are used as against wood ties under similar conditions.

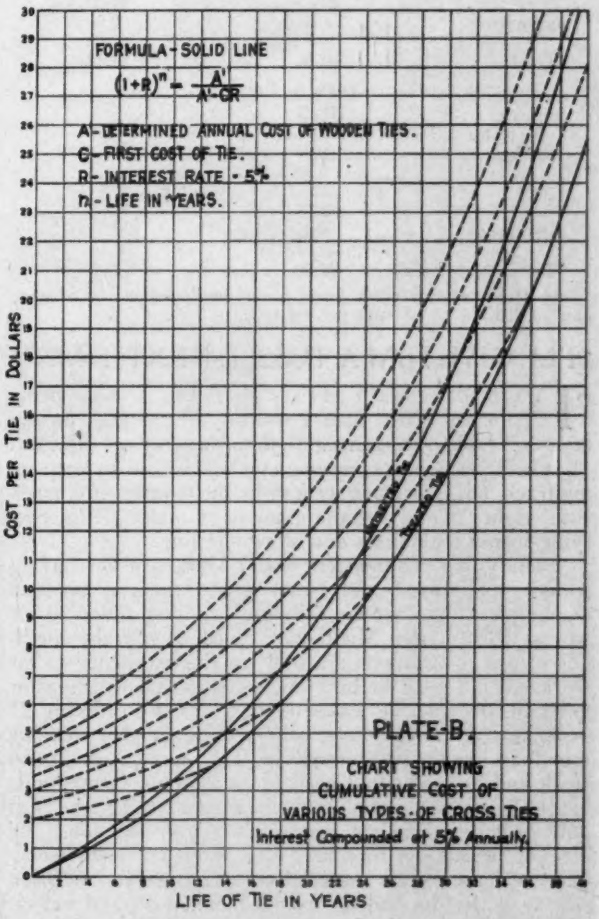

FORMULA - SOLID LINE
(1+R)^n = A'/(A'-CR)
A' = DETERMINED ANNUAL COST OF WOODEN TIES.
C = FIRST COST OF TIE.
R = INTEREST RATE = 5%
n = LIFE IN YEARS.
COST PER TIE IN DOLLARS
LIFE OF TIE IN YEARS
PLATE-B.
CHART SHOWING
CUMULATIVE COST OF
VARIOUS TYPES OF CROSS TIES
Interest Compounded at 5% Annually.

Plate "A" shows actual expenditures for any given period, the untreated tie, with life of 9 years; the treated tie, with life of 18 years, and substitute ties, ranging in first cost from $3 to $6, by 50-cent intervals, with indefinite life, the curves being carried out to 36 years. The chart is made up on a basis of 5 per cent interest, compounded annually.

In Plate "B" the curves for substitute ties are the same as Plate "A," and are shown in dotted lines. The curves

for treated and untreated wood ties (solid lines) show annuity value rather than actual expenditure at any given period. These curves are calculated from expenditures at renewal periods, as determined on Plate "A."

Plate "A" merely reflects the basic information by which the curves on Plate "B" for treated and untreated wood ties have been determined. Plate "B" will thus show that a substitute tie, having a certain unit cost in place, must last a certain number of years to become as economical as a good tie, for example—a substitute tie costing $3.50 in place must last at least 23 years and 4 months to be as economical as an untreated wood tie costing $2 in place with 9 years' life, and must last 35 years to compare with a treated tie costing $2.50 in place and having 18 years' life.

The cost of treated and untreated wood ties in place in these diagrams is based on the following assumed data:

	First Insertion	Second Insertion
UNTREATED TIE		
Untreated tie	$0.75	$0.75
Two tie plates	0.45	.....
Four spikes	0.05	0.05
Labor	0.40	0.40
	$1.65	$1.20
Transportation	0.35	0.35
Total	$2.00	$1.55
TREATED TIE		
Treated tie	$1.25	
Two tie plates	0.45	
Four spikes	0.05	
Labor	0.40	
	$2.15	
Transportation	0.35	
Total	$2.50	

The transportation costs given above are based on an average haul of 700 miles at 5 mills per ton mile.

"I'LL GIVE HIM A TUSSLE NEXT TIME"*

"I WONDER WHY IT is that I'm always being criticised every time a visiting official goes on my district?" asked Roadmaster John Murray of himself. "I've had years of experience and know how to keep up my track, but that don't seem to be the trouble—the track is all right; it must be the amount of material I'm carrying in my toolhouses and along the line.

"Some other roadmasters that I know are not having trouble—perhaps I had better study them a bit and maybe then I can see my failings." Suiting action to his words, Roadmaster Murray observed closely the methods of a man who won a medal for the excellence of his work. It did not take him long to learn that Roadmaster O'Brien, the man he was studying, was not ordering 25 or 30 per cent more joints, bolts, spikes, etc., for relaying jobs than were actually required. Of course, it was good stock and he might find need for it at some future time, but O'Brien was not doing this sort of thing—he was only ordering sufficient material to cover the job. He did not permit his foreman, even though a good workman, to have excess material or to misuse it. O'Brien saw to it that he had no excess hand, push and velocipede cars on his district, realizing that having these on his district made a shortage elsewhere and made it necessary to purchase more cars.

Murray found that when a set of switch ties were ordered and received they were inserted as soon as possible and not left waiting at switches for months before placing in track; if the entire set was not used, the odd ties were sent in to the store house or loaded on the supply train. If it was necessary to hold them on hand any length of time they were piled properly and old scrap ties used for bearings. Cross ties were handled in a similar manner.

O'Brien was very particular in anticipating his requirements sufficiently in advance so that he would not have gangs waiting for material or have to transfer them to another job while awaiting receipt of it. He was always careful in making a requisition to quote the standard catalogue reference or to give complete information and the purpose for which intended. This often saved considerable delay and correspondence, and enabled the storekeeper to advise him just what he could substitute in case the material ordered was not in stock. He realized that the simple writing of a requisition in a routine manner would not be sufficient and so stated the approximate date the material was required, and then if shipping notice was not received within a reasonable time, he would send a mailgram or wire to the storekeeper. If the job was cancelled he immediately notified the storekeeper, and did not wait until the material was shipped, only to return it.

If one of the company's standards was changed O'Brien would tell the storekeeper, and not leave him in the dark to continue providing material that was no longer required. He would keep him informed and confer with him as to the disposition of such material as was still on hand, and try to devise ways and means in which the same could be used up without loss.

On regular trips with the supply train he saw to it that the exchange system on tools was strictly carried out and soon realized that by carefully watching this feature there resulted a minimum tool expense for his district. Scrap was picked up regularly and he educated his men to the knowledge that every spike and bolt counted. He gave that as one of the reasons why he operated his district so economically. The credits, received from the scrap and second-hand material turned in, went a long way towards the debits for the new material he drew.

"Well," concluded Murray, "I've learned something from O'Brien, and it is all easy to do. In the future my superiors won't have any cause for complaint, and I'll give O'Brien a run for that gold medal at the next annual inspection."

*Taken from the Southern Pacific Bulletin.

TESTS SHOW RESULTS OF ELECTRIC SHOVEL OPERATION

SOME IDEA of the possibilities of electric shovels is to be obtained from the performance of electrically operated shovels excavating on the canal of the Queenston-Chippawa power project in Ontario. The machines, which are of large size, have been found capable of handling large volumes of material, three of them averaging 20,000 cu. yd. of rock and earth per day. Tests have been conducted with these shovels to ascertain the power consumption per cubic yard of material removed. Shovel No. 1 is a Bucyrus of 300 tons weight with a 90-ft. boom, using a five, six or eight-cubic-yard bucket. It is equipped with 440-volt, 3-phase, 25-cycle motors, including two 250-hp. motors for the hoist, one 150-hp. motor for the thrust and one 150-hp. motor for the swing. This shovel works 90 ft. below the surface and has loaded much of the material on cars approximately 70 ft. above its own base. Graphic wattmeter records taken in the course of the tests showed an average power consumption per cubic yard of material handled of 0.826 kilowatt hours for the entire test. Studies of the wattmeter charts show that typical cycles were completed in about 50 seconds, in which the average power demand was 320 hp. and the maximum 800 hp. It is interesting to note that considerable economies were effected by regenerative braking, i. e., power input while the dipper was being lowered.

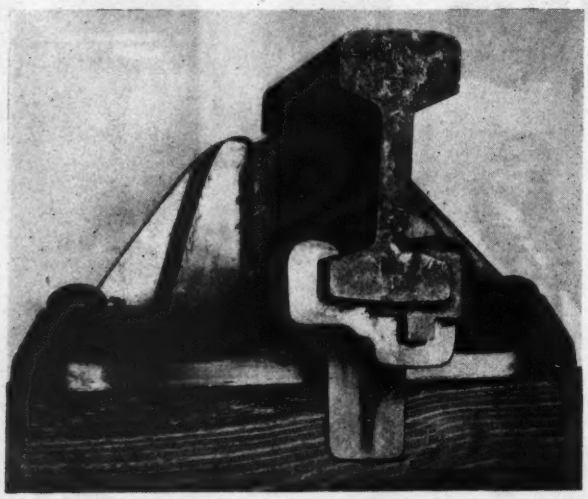
MARINE BORERS THAT DESTROY WOODEN PILES IN RAILWAY DOCKS AND TRESTLES

In the border, Teredo; in the center, Sphæroma (magnified 6 times); below, Limnoria (magnified 35 times).

A RAIL ANTI-CREEPER FOR BULL-HEADED RAILS

THE SYSTEM of permanent way as laid in the United Kingdom, whereby each rail is keyed by a wooden wedge on to a cast-iron chair bolted to the tie, presents greater resistance to rail creep than that offered by the flat-footed rail system of permanent way of America and elsewhere. However, rail creep still persists in England, and in places where conditions are at all favorable to this phenomenon further means have to be found to prevent it than are offered by the usual permanent way construction.

To meet this, the P. & M. rail anti-creeper has been modified in design to take the bull-headed rail, and has



One Manner of Applying a Rail Anchor to a Bull-Headed Rail

been adopted with excellent results by eight English railways, including the Great Northern and the Great Eastern.

In the illustration the bearing portion of the anti-creeper is extended in depth to engage the tie itself, but where the edge of the cast-iron rail chair is suitable the bearing portion of the anti-creeper is shortened to engage the chair, and the stress is then carried by the bolts of the chair to the tie.

MAKING WOOD FIRE RESISTANT WITH PAINT*

FIRE RETARDENT paints are the most practical means so far discovered by the Forest Products Laboratory by which small amounts of wood can economically be made fire resistant. The only other known methods of decreasing the inflammability of wood are to keep it wet, or to inject into it certain chemicals under pressure. These methods, though more effective than painting, are usually either impracticable or too expensive to be considered.

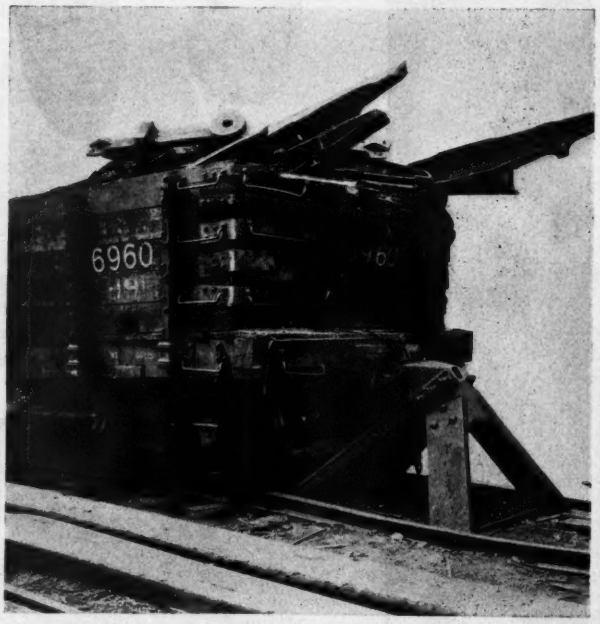
Ordinary calcimine or whitewash has proved in tests to be as fire resistant as any paint covering tried. It is cheap and convenient to use. Although it will not prevent the burning of wood exposed continuously to a high heat, a good coat of calcimine on wood will decrease the danger of a blaze spreading from burning cigarettes, sparks, matches and similar small sources of fire. Calcimine is, of course, more effective for inside than for outside use.

For exterior use numerous patented fire retardent paints are available. An effective outdoor paint which has been developed at the Forest Products Laboratory consists of linseed oil, zinc borate and chrome green. This paint has maintained its fire resisting properties through more than three years of exposure to the weather.

*From Technical Notes No. 106, issued by the United States Forest Products Laboratory, Madison, Wis.

AN ALL-METAL BUMPING POST

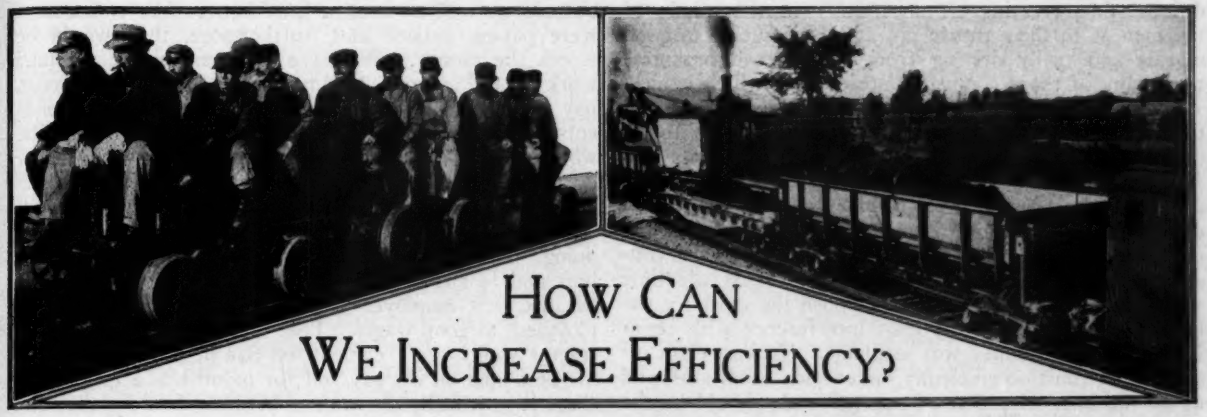
TO MEET certain requirements which are encountered occasionally, such as climatic conditions, the necessity for frequent changes of location as well as a demand for a cheaper post, which appear to require an all-metal bumping post, the Mechanical Manufacturing Company, Chicago, has developed a new post known as the "Durable bumping post." This post consists essentially of a pair of inclined, bent rails fastened on the front ends to the track rails by means of separators and bolts, and supporting a ribbed bumper casting which receives the impact of the car. This bumper casting transmits the blow through two 12-in. 35-lb. channels, fastened at their lower ends to the running rails by means of separators and bolts. The connection of the channels to the bumper casting and to the running rails is such that the stress is transmitted in direct bearing by the ends of the



A Severe Test for a Bumping Post

channels with practically no stress on the bolts. The post is further strengthened by the addition of a pipe separator and rod placed between the rails in front of the post and another between the rails and channels at the rear of the post.

Among the advantages to which attention has been directed by the manufacturers is that this bumping post combines light weight with strength. The shipping weight is about 1,300 lb. It occupies only 3 ft. 4 in. of track space from the face of the bumping block to the extreme edges of the inclined channels. The simplicity of the device, as illustrated in the photograph, makes for ease and speed in installing. As a consequence, the post can be transferred readily from one location to another. The photograph shows the behavior of the post under an actual service test.



How Can We Increase Efficiency?

WITH APPROXIMATELY 60 per cent of the total expenditures of the maintenance of way department going for labor, no argument is necessary to demonstrate the necessity of so organizing the forces as to secure the maximum return. That maintenance officers are fully aware of this situation is indicated by the large number of constructive suggestions contained in the 21 papers received in the contest entitled "Means of Restoring the Efficiency of Maintenance of Way Forces." The two prize winning papers and four other papers received in this contest were published in the July issue, page 269, while eight papers were published in the August issue, page 309. Other papers which were received in this contest and which contain equally valuable suggestions follow:

MUST DEVELOP SPECIALISTS

By E. M. Grime
Supervisor, Northern Pacific, Fargo, N. D.

THERE IS A prevailing idea that the men in the maintenance of way department of our railroads are not nearly as efficient as they formerly were. While this may be true to some extent, it is also true of workmen in other departments and in other industries and in a large measure must be considered simply as one of the results of the great war, due to the lowering of morale after the tension of years of strife. As far as maintenance of way men are concerned, any apparent lack of interest may be traced in large measure to the fact that the skilled men are somewhat discouraged because they see that the differential previously existing between their compensation and that of the common laborer is now almost wiped out and they are inclined to feel that years of experience and faithful, loyal work are not fully appreciated. In other words, the theory that the high cost of living hit the laborer harder than the mechanic has not worked out exactly true in practice, or at least it does not satisfy all classes. The skilled trackman or bridgeman finds that high prices are forcing him to lower his scale of living, while the laborer is able to advance slightly or to at least hold up his scale.

Some investigators have calculated that the dollar is now worth 42 cents as compared with before the war prices and on this basis the laborer today is still able to buy just about as much of meat, flour or other necessities with his 40 cents per hour wage as he could with his 20 cents in 1914, whereas the carpenter at 56¼ cents per hour can buy only 24 cents' worth now, as compared to 35 cents' worth previously, and the track foreman now getting $100 per month can purchase only $42 worth, as compared with $75 worth in 1914. To keep men loyal we must give them fair, adequate compensation and upon this loyalty depends interest and that efficiency so much desired and so necessary at this time. It is hoped that the newly appointed wage board will be able to adjust some of these irregularities satisfactorily and thus go a long way to improve the morale.

Some officers call attention to the prevailing high rates of pay and the corresponding enormous increase in maintenance expenditures, but it must be remembered that practically everything is on a correspondingly higher price level and these rates of pay still range well below what is paid by contractors and also in the industries. About the only thing not yet on the higher price level is the railroad freight rate, and this must be raised if the transportation machine is to survive. Under existing conditions we may gain a little by somewhat closer attention to details and possibly a little more careful supervision, but after all it must be admitted that the eight-hour law, seniority rules, organization of the men, etc., have created a serious handicap to the most efficient results. These changes in working conditions are here to stay, and as we must conform to them we must learn to offset them by economies in other directions which can be effected by labor-saving devices and improved methods of organization. It seems most likely that the savings which will really amount to anything must be developed through radical changes in the methods of handling the work, which must be worked out by the officers on each railroad.

If maintenance of way work could be concentrated in a shop building, where weather conditions as well as other conditions too numerous to mention but seriously affecting it could be eliminated, it might be possible to apply those elaborate systems of scientific management that have been so carefully worked out for certain industries, and thus we might know that our trackmen were scientifically tamping the ties, carpenters sawing the lumber to the best advantage, etc. By the very nature of things this is practically impossible, and a far more important consideration is to be sure that what work is accomplished goes to make up its part in the ultimate scheme of betterment so that no work is done which later on may have to be thrown away because it does not conform to the general plan of progress.

To improve morale the first thing to be considered is a system by which absolute continuity of employment will be guaranteed, regardless of whether the cotton crop in the South, the wheat crop in the Northwest or the corn crop in the Middle states is a failure or not. In the past it has unfortunately been the rule that the amount to be spent on maintenance and improvement work has been largely dependent on these and other factors, with the result that the maintenance department has found it necessary to organize and disorganize with changing con-

ditions, thus creating an uncertainty in the minds of the men as to their future not at all conducive to good morale and really driving from the railroad organization many of those competent steady men which it most needs. Thus, when commercial business was good and the railroad consequently busy, was just the time to increase forces, carry on all kinds of improvements and further burden the transportation machine with company business. Again, when commercial business slowed down, all railroad improvement work stopped and the maintenance forces were reduced to the lowest basis consistent with safety. In other words, just at the time when railroad officers could accomplish the most for the least money and with the least interference with regular business, no money was available. No important industry can function efficiently under such conditions, and of all the industries that of our railroads should be the last to be affected in this way because, no matter what business depressions or other catastrophies may come, the railroad, being a part of our very existence, will still be required, and anything done to make it 100 per cent efficient for service is in the long run not lost.

Now, there are no doubt very good financial reasons why this policy has seemed to be necessary, but if we are to get the maintenance department down to a really sound basis there must be worked out for each railroad a large ultimate plan to which every minor improvement should conform and some system of financing so that it may be possible to lay aside for addition and betterment work a regular stated amount of money which can be spent each year regardless of outside business conditions. The maintenance department can then plan on just what bank widening, ballasting, ditching, rail laying, new buildings, bridges or other improvements can be done each year and organize permanent forces accordingly. Each operating division must have its own track and bridge and building forces to carry on the regular yearly upkeep, but practically all improvement work to be handled with economy should be directed from headquarters and performed by special crews which should cover the entire system, moving from one division to another as work is authorized, this work to be arranged so as to keep these special crews fully engaged the year round on this particular class of work. On some small railroads this may be impracticable on account of weather conditions, but it will work out advantageously on many of the large systems and to some extent is already in operation. It is possible that smaller railway systems might arrange to work together on their improvements, so that a road in the North, for instance, could use the ballasting and rail-laying crews in the summer and then turn them over, foremen and men, to its southern neighbor, where the crews could continue with the same line of work throughout the winter season. Even the common untrained foreign laborer if constantly employed in the same line of work, such as rail laying, for instance, will soon become expert at it and his efficiency will be raised to such an extent that large savings will be made in labor costs. By giving him first-class outfit cars, providing good board and paying him merely the ruling rates for his class of work he will be kept contented and the railway will thus build up for itself in the maintenance department a competent loyal organization which will be strictly efficient in every sense of the word.

The wage question has always been a serious one, and it has been the policy to pay railroad men somewhat less than contractors were paying for similar work. On account of the nature of the work and the impracticability of absolutely close supervision this has seemed advisable, but with the proposed crews, each handling special work and these men becoming experts in their line, they could be paid as well or even a little better than contractors were paying outside and, furthermore, they would be worth the money. We have all seen contractors take work on the railroad, bidding within the estimated cost, pay much higher wages to workmen and superintendents than were paid by the railroad, and yet complete the work expeditiously and come out with a nice profit. How do they do this? Not because they have better supervision, but because they have an organization of competent men, experts in the particular line of work they are doing. Every man understands just what is required of him and is absolutely loyal to his employer's interests because that employer guarantees him continuous employment at good wages. That this system pays the contractor well is very evident, or else he would not carry his best men on his pay roll for months at a time when there is practically no work to be done, just for the sake of holding his organization together. It is practically impossible for any set of maintenance officers, no matter how competent, to handle work with strict economy when one season they must organize for an enormous amount of track and building construction and the next season dispense with most of the organization because no funds are available. Competent men are not attracted by such unstable conditions, and the maintenance department must therefore depend much of the time upon the second-class men whom the contractors discard.

The proposed permanent floating gangs to take care of all extensive improvement work aside from regular running repairs should be provided with all modern equipment just as the contractors find economical in their work. Many a job undertaken by railroad forces costs much more than it should just because modern equipment is not available. One ordinary job on a certain division may not justify the purchase of certain labor-saving machinery, but given half a dozen such jobs on various parts of the system, let one crew handle them successively and the new machinery will soon pay for itself.

In other words, if we are to obtain ideal results in the maintenance of way department, the major portion of the work must be done by specialists in each class of maintenance, these men to be paid the ruling rates and made contented by comfortable living conditions and a guarantee of steady employment. Add to this the best of labor-saving devices and there will be no occasion for either the public or the managers to see anything but real efficiency in this important department of the railroad industry.

ELIMINATE THE BAN ON OVERTIME

By B. C. TAYLOR

Bridge Foreman, Chicago, Rock Island & Pacific, Topeka, Kan.

THE OLD-TIME EFFICIENCY will never be restored as long as the maintenance officers' hands are tied with agreements, seniority rights and other red tape and the men are working on a minute basis. If we were back on the old basis of a few years ago where none of the red tape interfered with getting the work done, and maintenance men were paid wages in proportion with other departments and industries, good men could be gotten and kept; as a man would rather work for a railway for 25 to 50 cents less per day than for most outside industries, as it is steadier work, and he is not continually losing time moving from one job to another.

Working on a minute bases, and not being allowed to put in an hour overtime without permission from the management is a bad feature, which works a hardship on the foreman and creates dissatisfaction among the men. A foreman may be working on a job four or five

miles from a station, where his outfit is tied up, and although, when the day's working time is up, he may be able to finish the job by working 30 minutes or an hour overtime and then be ready to move to his next job that night, under the present instructions he is not allowed to do that. When the men are held down to a minute basis they have no inclination to help finish a job of this kind as an accommodation. If the foreman on the job has authority to use his own judgment in cases of this kind, and give and take with the men, it will go a long way toward bettering efficiency, for I find that, in my 15 years' experience as a foreman, that when you treat men right and show that you appreciate what they have done, 75 per cent of them will go out of their way to please you. But when no appreciation is shown, you will hear the men say, "What is the use of our worrying over the work; if the company doesn't care, why should we?"

IMPROVE WORKING CONDITIONS

By WALT DENNIS

Division Engineer, Wabash, Moberly, Mo.

I THINK WE all agree the section laborer is a pretty good sort of fellow at heart. He is always willing to do any kind of work, clearing up wrecks, transferring bad order cars, cleaning around stations, and in fact almost any kind of work that no one else is required to do. During the winter months, when our line gets tied up, he is always called out during the night in the worst kind of weather to open up traffic, and very seldom you hear any complaint from him.

His pay as a rule is the smallest of any employee on the road and he works the hardest. His work as a rule is carried on in the summer, and when it comes winter he is laid off to shift for himself. This naturally gives him a roving spirit and we cannot blame him very much for leaving this class of work. In looking through the want advertisements almost any day you can find advertisements for men at from 50 to 100 per cent more wages than a sectionman receives.

We must have some remedy for these conditions, and the right way for us to start is to make better conditions for our section laborers. There are many ways this can be done. For instance, we can make their living conditions better by furnishing them a little house which can be built either new or by remodeling some of our bunk cars. I have seen some very neat little homes made out of cars which have been condemned. By furnishing them a home of this kind they can be allowed to till the near-by right of way before and after working hours which will cut down living expenses very materially. Another thing we can do is to furnish them a motor car to go to and from their work. They can get out on the job in the morning fresh instead of pumping one of the old hand cars and spending from one-half to one hour going to the further end of their sections. Also in the evening when they come home they can rest instead of having to pump the car into their tool house. This gives them a better spirit and a better feeling.

Another thing we can do is to have meetings from time to time, bringing the foremen together and allowing them to exchange ideas, giving them new ideas, either by the supervisor, the division engineer or other supervising officers. At present there are numerous reports necessary for the section foremen to make up and at these meetings these reports can be gone over and the necessity and the proper method of making them out explained. Great benefits are secured from these get-together meetings of the foremen.

It will also be well to try to keep the men on the job as far as possible the year round. I am of the opinion that in the extra gangs there should be some arrangements made whereby in the summer months they can work in the North and in the winter months in the South, thus allowing these men to work the year round and getting away from the present method of shipping these men long distances, which we know is very expensive, as probably less than 20 to 30 per cent of the men who are shipped out by labor agencies ever reach the work and stay.

By eliminating the difference in the rates of pay for the same kind of work on different roads in adjoining territory a great deal of discontent can be overcome, as a few cents' difference causes laborers to leave one job to go to another, without taking into consideration the class of work. I have known of cases where even a half cent per hour would cause men to pick up and go to other work.

Summing up, it is my opinion that by spending a little time to improve living conditions and providing work the year round, instead of laying off men during the winter months, we can greatly improve our labor conditions at the present time in this country.

BETTER LIVING ACCOMMODATIONS FOR FOREMEN ESSENTIAL

By H. P. STAFFORD

Assistant General Roadmaster, Duluth, South Shore & Atlantic, Marquette, Mich.

IT NOW LOOKS as if the railroads were getting back to their old habit of pre-war days, of bidding against each other for labor. While I do not know of any change in the rates per hour, many lines have changed the working day from eight to ten hours, with time and one-half for the ninth and tenth hours. This must in time drive all lines to the same practice, for as in pre-war days, it will cause a lot of lost time by men going from one road to another or from one part of the country to the other. I think the only solution of this problem is to set a standard rate per hour, which rate should be about that paid common labor in other industries, such at street work, highway improvements and other lines of work employing common labor, as the days when men will work on the track for 10 to 25 per cent less than in other lines of common labor are past.

While a great deal has been written on means of holding labor on track work, especially on better housing and living conditions, there seems to have been very little done over the country. One will see the same old section houses, just about large enough for the section foreman and his family, yet he is expected to board and house from three to six men, especially at outlying points where there is no other place to board men. This practice not only causes good men to leave, but we also lose a great many good foremen, as they will not stay on sections under such conditions. My idea is that at places where foremen must board and house the men there should be a good, fair sized section house for the foreman and his family and a bunk house located from 50 to 100 feet away for the men, this to be supplied with six to eight sanitary bunks, with a room in one end suitable for the men to read and smoke in. In this way the men would only be in the section house for meals. It would certainly help to hold foremen at such places and be more comfortable for the men.

Then, again, on most roads we still see the same old box cars used for boarding cars for extra gangs. In most cases they are converted into boarding cars after they are no longer fit for general freight service. While some roads have made considerable improvements in this line, the large majority have done very little. I under-

stand that roads that have already discarded the old box cars and put on good boarding cars are finding less trouble to hold men.

With the class of foremen we now have we must have closer supervision and roadmasters or supervisors should not be expected to cover too much territory. Shorter divisions and more time with the crews will save the railroads many dollars in the course of the year. Very few, if any, roads today have all good up-to-date foremen and a roadmaster cannot take care of from 150 to 200 miles of track, as many of them have, and give it the close personal supervision necessary to get the most out of the men and also maintain a closer check on use of material.

PERSONAL INTEREST IN MEN HELPS

By J. J. Hess

General Roadmaster, Great Northern, Seattle, Wash.

EXPERIENCE HAS long ago taught us that good results are only obtained by showing a personal interest in our men's welfare. We strive to impress upon foremen the advantages to be derived by obtaining their men's good will, as they are possessed of as much pride as any of the rest of the human family and are just as sensitive to recognition or adverse treatment as anyone.

We give our men to understand that we are interested in them to the extent that if they desire to advance and remain in the service we will aid them by teaching them the general features of track work. We have the foremen let them surface and line the track, and it is understood that when a foreman advises the roadmaster that a man is qualified he is selected for advancement as soon as an opportunity is afforded.

I have often thought of the possibility of inaugurating a campaign to make known the advantages to be derived from entering the track department. The men in this service are now usually looked down upon, largely because so many of late years have not been of the English-speaking class, yet they demonstrate better traits of character than many of their critics. For instance, in my 40 years' experience I have never known where they have ever refused to respond when called upon, day or night. If there is not too much difference in wages as compared with other occupations (which at present writing is the case), the furnishing of free quarters, fuel, light, use of company's right of way for planting gardens, keeping chickens, cows, hogs, constant employment, healthy work and no expensive clothes required while working, are all advantages which may well be emphasized. The opportunities for saving (and it is that which counts in the end) are more than are generally known.

AN HONEST HOUR'S WORK FOR AN HOUR'S PAY

By G. S. Crites

Division Engineer, Baltimore & Ohio, Baltimore, Md.

THE MOST IMPORTANT step to be taken in increasing the efficiency of maintenance of way forces is to start after an honest hour's work for an hour's pay. Taking pay for an hour's work when an honest hour's work is not given is stealing, and taking pay for an inefficient hour's work is getting money under false pretenses. Obtaining money by theft, or under false pretenses must be made disgraceful. There yet remain enough honest workmen in the maintenance of way department; men who take pride in the quantity and quality of their output, to form the foundation of an organization that will talk less about what is gotten and more of what is earned.

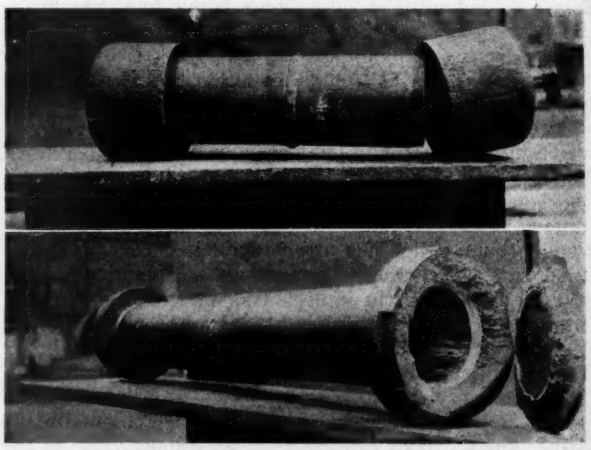
No matter how honest or willing the workers are, the work they are to do must be fully planned, or else lost motion will result and no good measure of the output can be made. The planning must be complete enough to assign each man or group of men to a task, thereby making it possible to pick out the dishonest workers. The thieves, shirkers and loafers must be put off the work, even though the gang be below its allotted size. All should know that a good hour's work is expected for an hour's pay.

The lowering of the morale of the maintenance of way forces has not been quick and sudden. It has been accomplished so gradually that we have not seen the let-down from day to day. The building up process will take about as long as the beating down. Where foremen, supervisors or division officers have stood firmly against lessened output and poor work, the work of regenerating the forces will not be hard. Some territories are known where the minor supervising officers have advised men to slacken up in their work, and on such territories there is a long, hard fight ahead to bring the output of work back to normal.

On the whole, the problem simmers down to close, intelligent supervision, aided by a carefully planned educational campaign.

A WELDING TEST

THE POSSIBILITIES of welding by the oxy-acetylene process was illustrated recently in a test of some sections of welded pipe conducted in the Buffalo laboratory of the Linde Air Products Company. Two short sections of standard three-inch wrought pipe were welded together and capped, as shown in the illustration,



Two Types of Failures Resulting from the Test, Neither of Which Injured the Weld

one of the caps being fitted with a small copper tube for applying pressure by means of water. This test was carried to a pressure of 6,200 lb. per sq. in., when the test had to be discontinued because one of the caps blew off by stripping the threads. A test on a four-inch pipe was discontinued for the same reason after a pressure of 4,400 lb. had been reached. These tests were repeated on several pieces of pipe but in no case did failure of the pipe occur at the weld.

Railway Deficit in Sweden.—An official statement states that the expenses in the year 1919 exceeded the receipts by the Swedish State Railways by 1,107 million kroner, or about $3,000,000.

RECENT HIGHWAY CROSSING CONSTRUCTION

Planked Types Still Predominate, Though Substitute Installations Show Considerable Progress

WITH LUMBER increasing rapidly in price and difficult to secure, it is especially opportune at this time to present a study of highway grade crossing construction. While the following article does not attempt to discuss the advantages or costs of the various types of crossings and crossing materials, it does describe the standard practice on representative roads throughout the country. As such it should be of interest in determining a program for renewals and repairs in future work. The types shown include crossings of solid-plank, semi-plank, paving block, concrete, straight macadam, macadam with bituminous binder and a new commercialized product recently developed for platform and crossing work.

The question of a thoroughly satisfactory form or method of constructing a highway grade crossing is apparently as unsettled as it was four or five years ago. While considerable progress has been made, no standard practice or design has been evolved as yet which could be called entirely acceptable to the majority of the railroads. In general, plank or semi-plank crossings have predominated chiefly because of their cheapness and because of the ease with which they are installed or removed for maintenance work on the track. The first factor, that of cheapness, no longer applies, and it is doubtful if the second factor actually carries any particular benefits when compared to the disadvantages of this form of track crossing.

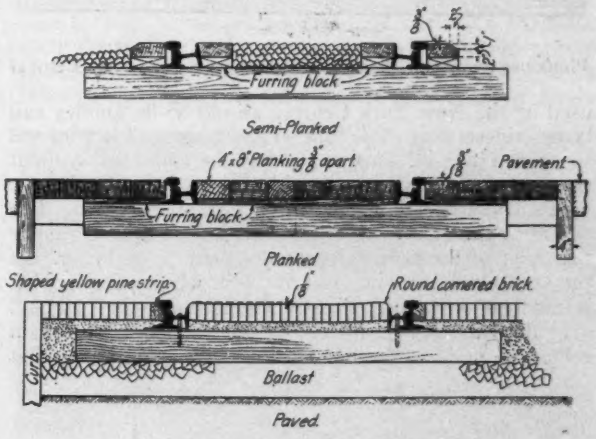
To date only a few of the roads of the country have adopted such substitutes for timber crossings as asphalt, crude oil, macadam or concrete. Where the latter has been used it has generally been in the form of concrete planks, which have been cast at some central plant and then shipped to the different localities where they were needed. The subject of substitutes for timber received considerable attention at the last meetinig of the Roadmasters and Maintenance of Way Association, a report on this subject being published on page 355 of the October, 1919, issue of the *Railway Maintenance Engineer*. It was brought out at this time that about 76,800,000 ft., board measure, of lumber, amounting to $2,457,600 at 1918 prices, was being used in highway crossings, excluding street crossings, which are sometimes planked solidly from one side to another across a number of tracks.

The recommendations made in that report included the securing of the best possible drainage, the elimination of all rail joints and, in order to conserve lumber, the installation of crossings constructed from crushed stone or rock of standard size mixed with good crude oil, bituminous macadam, asphalt or other equally good substitutes. By its sealing action the use of this type of construction will eliminate, to a large extent, the heaving of track by reducing the amount of moisture or frost which would ordinarily penetrate the crossings.

NEW YORK CENTRAL USES THREE TYPES

The three types of crossings which are shown for the New York Central include one for use in cities with paved streets, a ballasted plank crossing for streets and important highways in the state of New York and a semi-plank crossing for less important streets and highways in that or other states traversed by this line. The preliminary work in these installations is the same for all three types. All tracks at highway crossings are ballasted with at least 8 in. of rock under the tie, while proper drainage is provided to the nearest water course. The ties are tamped thoroughly and the track is put in the best possible shape in regard to line, surface and condition of ties, tie plates, etc.

In the case of crossings paved with brick, the ballast is only brought up to the base of the ties, the space between the ties and at the ends being filled with a 1-5-9 mixture of concrete to the level of the top of the ties. Plates are then inserted under the rails to secure a minimum height of 6 in. from the top of the tie to the top of the rail, after which flangeways are prepared by the use of old rails laid on their sides and spiked down as shown in the drawing. A 2-in. dressing of sand is then spread over the ties and the concrete filler, after which standard paving bricks are laid with close joints and thoroughly rammed, the surface being given a slight slope away from the rail. In order to secure a close fit along the outer edge of each rail special pieces are shaped from



Three New York Central Standards

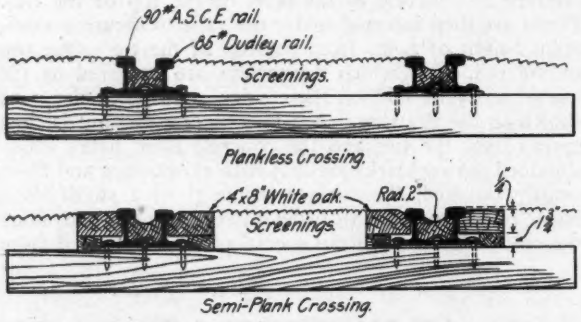
4-in. by 6-in. yellow pine timber, which are then soaked in crude oil and laid with their tips ⅜ in. below the top of rail. The crossing is next swept thoroughly clean and each joint filled to the surface of the pavement with hot paving pitch and hot sand, the pitch and the sand being poured simultaneously from separate vessels having small spouts in such a manner as to thoroughly mix and form a bituminous mortar or concrete. After these joints have been properly filled the surface of the completed paving is given a slight sprinkling of sand.

The solid plank crossing is built up in the customary manner, the planking consisting of 4-in. by 8-in. timbers laid 3 in. apart. Furring blocks are used to secure the necessary height of ⅜ in. below the top of rail. The ballast in this type of crossing is kept 2 in. below the top of the ties and this, in addition with the space caused by the use of the furring blocks, gives approximately a 3-in. air space. The planking is spiked down diagonally with 10-in. wrought-iron spikes to prevent the plank from heaving. The flangeway is formed by the use of old rails as in the preceding case. Where the street paving is of brick, wood-block or concrete, a 4-in. by 18-in. header is placed with its long side vertical as a bond be-

tween the crossing and the pavement. The semi-plank crossing is simply a modification of the above. Lighter timbers, consisting of 3-in. by 8-in. planks, are used, and only one piece is placed on each side of the rail. The space between the two inner planks and, in the case of two or more tracks, the space between the tracks is filled flush with the surface of the planking with gravel or broken stone, well tamped or rammed. The planking is supported on furring blocks as in the preceding case and is maintained at approximately the same height.

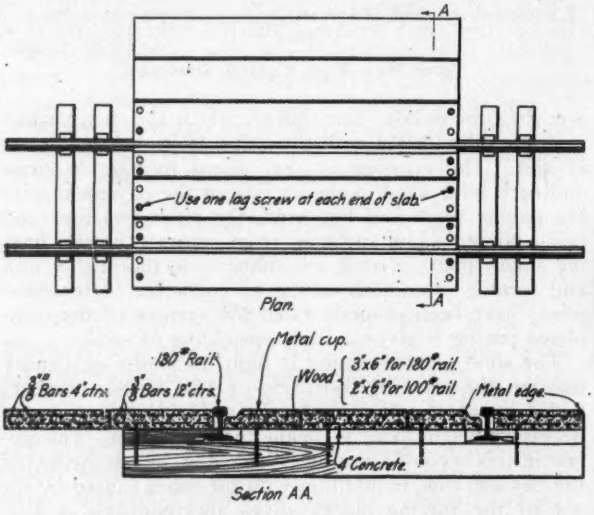
INSTALLATIONS ON THE CENTRAL OF NEW JERSEY

In the semi-plank and plankless types used on the Central of New Jersey a minimum depth of 15 in. of crushed rock ballast is maintained below the base of rail. The flangeway is constructed in a different manner than that



Plankless and Semi-Plankless Crossing on the Jersey Central

used on the New York Central, an old 85-lb. Dudley rail being laid vertical. The base of the flange rail is trimmed so that a 2½-in. flangeway may be obtained without contact of the flange rail with the main rail. Flange width is maintained by shaped oak strips, as shown. The height of the guard rail or flange rail must not be greater than that of the main rail or more than ¼ in. lower. In the semi-plank crossing 4-in. by 8-in. white oak planking is notched or shaped slightly to fit under the ball and over the base and tie plates of both the guard and main rails, and laid on furring blocks of such thickness that



Concrete Crossing Used on the Pennsylvania

the surface of the planking will be ¼ in. below the top of rail. These are spiked down diagonally to prevent heaving. The ends of the guard rails are curved inward slightly and provide a 4-in. opening at each entrance of the flangeway. This opening is maintained and the installation strengthened by the use of filler blocks taken from old frogs which are bolted to the guard and main rails by two 1⅛-in. bolts for each block.

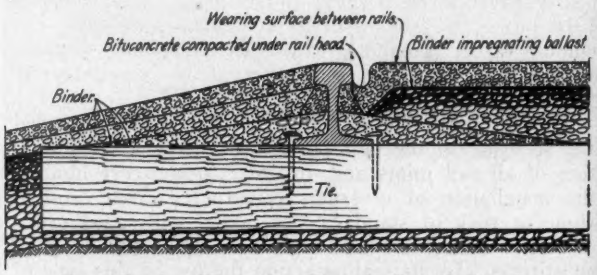
The space between the inner plank in one type and the guard rails in the other as well as the approaches to the crossing are built up with ballast, well rammed and given a surface dressing of screenings. The surface of this type of crossing is kept level between rails and for

End View of a Concrete Crossing

a distance of 15 ft. each way from the gage side of the outside rail, on both single and double track.

SUBSTITUTE CROSSING INSTALLATIONS

Numerous methods have been employed in the substitution of other materials for timber for crossing installations and in the majority of cases they have resulted not only in eliminating timber, but also the use of old rails for the flangeways. An interesting type of concrete construction for this purpose has been developed by the Universal Portland Cement Company, the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St. Paul and several other roads, as described in considerable detail on page 111 of the March, 1918, issue of the *Railway Maintenance Engineer*. In general the methods consisted of precasting the concrete in slabs varying from 4¾ in. to 6 in. thick; from 8 in. wide up to one-half the width between flangeways, and from 5 ft. to 8 ft. long. In reality the concrete construction has taken two different forms. In the case of the 4¾-in. by 8-in. slab the design is about the same as for a plank crossing, the slabs being reinforced and supported on furring blocks, while in the other method the slabs rest directly on the



Cross Section Through a Bitumin Bound Crossing

ties or on a thin cushion of sand and only 2 to 4 are used between flangeways, as shown in the illustration.

A plankless crossing of an entirely different type has been developed on the Lehigh Valley which has given very satisfactory results. This type of crossing follows the macadam idea presented at the Roadmasters' convention a year ago. In constructing this crossing all ballast and dirt is removed down to the bottom of the tie and for the full width of the roadway. Such ties as are not good for at least three years of service are replaced, while tie plates are installed where not already

provided. The track is then thoroughly tamped and put in first-class condition for line and surface. In automatic signal or electric circuit territory the rail is insulated on all sides by the application of a penetration asphalt or some similar insulating material.

The space between the ties and between the tracks is next filled up to the under side of the ball of the rail with clean stone ballast, well rammed or compacted. A mixture is then made up of an oil binder and a good grade of clean stone screenings containing particles of stone up to ¼ in. in size, but with the fine dust and dirt screened out. The mixture thus made is spread over the surface of the road and thoroughly rolled or tamped to the level of the top of the rail. No provision is made for a flangeway, the action of the wheels along the rails being depended upon to create and maintain their own flangeway, as shown in the photograph. This has proved very satisfactory and at present the Lehigh Valley has very few planked crossings in service.

The Chicago & Northwestern has successfully used a modification of this method for farm crossings and less important highways. However, no oil binder is used in

Contrast of the Old and New Crossing on the Lehigh

these installations, although in general no difficulty has been experienced because of this or because of the lack of a fixed plankway. The space between the rails is built up as in the preceding case with clean rock ballast which is given a light dressing of screenings.

One of the recent developments in the line of plankless crossings is a form of construction introduced by the International Bituconcrete Company, New York, which gives a crossing with a good wearing surface and a permanent flangeway, and in addition acts as a seal against the entrance of water to the roadbed. Two classes of material are used in this type of crossing, one a bituminous cement or binder, and the other a prepared and vulcanized mixture of which the crossing surface is built up.

In preparing for an installation of this character all ballast, etc., is removed down to the level of the top of the ties. Rail joints are then eliminated, either by the rearrangement of the rail or by the use of extra long rail, and the track is put in first-class condition as regards ties, line and surface. The ballast is then penetrated with the above mentioned bituminous cement or binder, which is applied as a light fluid which hardens under the action of the air to an elastic solid, completely filling the interstices of the ballast. The tops of the ties and the rails are then swept clean of dirt or dust and the sides of the rails, the tops of the ties and the surface of the ballast are thickly coated with the filler. The crossing proper is built up of layers of the surfacing material, separated by thick coats of the filler and carried at least four feet from the rail on the approaches, while the center, or parts between the rails, is built up of a tapering layer of the prepared bituconcrete with ballast on this, after which a top dressing of binder is applied and then about two inches of the surfacing material. This outer material is applied hot and then thoroughly compacted.

The surfacing material is composed of 20 per cent of ⅜ in. to dust trap rock, 20 per cent of denatured hard-

The Bitumin Bound Crossing of the Lehigh

wood fiber mixed with 30 per cent of impalpable mineral dust colloidally suspended in 30 per cent of 99.1 per cent pure bitumen of normal 50 to 55 penetration. The entire mass is then vulcanized by sulpho-chlorination to form a sort of synthetic rubber. The hardwood fiber denatured by extracting its sap, acids and cellular tissue forms the reinforcement of the surfacing material through its ability to absorb the preservative binder

A Typical Installation Built Up of Ballast and Screenings

which, after vulcanizing, gives a mass strengthened in a manner not unlike that of reinforced concrete. Being somewhat similar to rubber in its elastic quality this structure is kept "live" by the vibration set up by trains passing over the crossing and thus shows no tendency to break away from the rails.

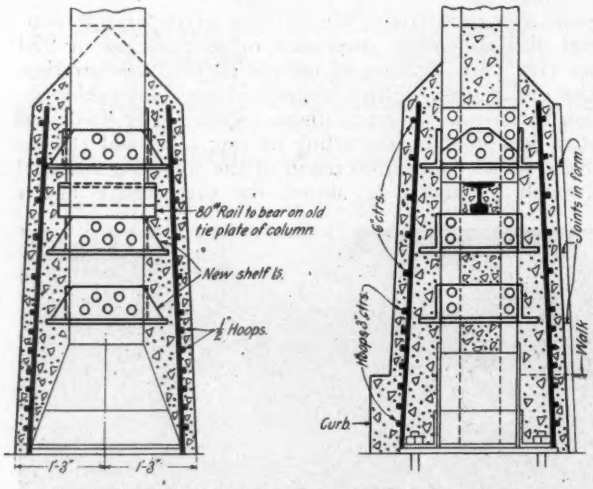
In recent compressive tests on a 12-in. cylinder 6 in. in diameter the filler of the aggregate was found to have more strength than any other part of the aggregates, the trap rock content breaking in two in each test before separating from the filler, while a sample, measuring 3 ft. long, 8 in. wide, by 2 in. thick, supported at the ends under ordinary room temperature, bent double of its own weight before cracking.

LABOR ALSO ON TRIAL.—It may be that private control *is* on trial. Equally true, however, is the fact that another great element in our national life also is on trial. Not only must the railroad managers show their ability, but the men and women they employ must demonstrate their willingness to work and their right to the wages recently awarded them by the United States Railroad Labor Board.—*Statement by E. E. Loomis, August 16.*

REPAIRING TRACK ELEVATION SUBWAYS

THE SUBWAY structures that carry elevated railway tracks over city streets are subjected to severe service conditions. The exposure is most unfavorable to the maintenance of the painting and therefore the steel work itself. The conditions imposed in the design of the earlier structures not only precluded the use of open decks, but made it practically impossible to provide reasonably watertight construction for the solid deck construction required by the cities. Often the number of tracks is so great that the subway becomes virtually a tunnel where darkness and dampness favor corrosion and the accumulation of filth. As a consequence, the inspection, cleaning and repair of the structure is conducted under circumstances that discourage efficient and conscientious work.

It is not surprising, therefore, that maintenance problems encountered in connection with such structures are often very serious and nowhere has such work been more extensive than in Chicago, which has a larger track elevation mileage than any other city in the world. The



Sections Showing the Concrete Reinforcement

first track elevation structures, those built by the Illinois Central just previous to the World's Columbian Exposition in 1893, were recently replaced by reinforced concrete subways, the reason for replacement in that case being inadequate load carrying capacity rather than condition of maintenance.

The next grade separation project of any magnitude undertaken in Chicago was that of the New York Central and the Chicago, Rock Island & Pacific between Sixteenth street and Sixty-third street, Chicago, and inasmuch as this work has been in service for considerably over 20 years, it is not surprising that defects have developed which have demanded the close attention of the bridge department officers. One of the most troublesome conditions experienced on the New York Central subways is the corrosion of the lower portions of the columns in the center of the streets and along the curb lines. These columns are composed of two 12-in. channels tied together at intervals by batten plates. Some of these have been found to have suffered a reduction of 50 per cent in cross-sectional area as a result of rust induced under the unfavorable conditions of exposure and also to a certain measure through uric acid corrosion. This is particularly the case with the curb line columns which are much more seriously affected than those in the center line of the street, even though the latter are subjected to more spattering with mud and filth from the roadways.

To correct this condition 110 curb line columns of the subways in Sixty-third street, Sixty-first street and State street have been reinforced by incasing the lower portions in concrete to a height of about 3 ft. 7 in. above the walks or 4 ft. 7 in. above the column bases. The concrete walk was removed from around the columns in order that the concrete incasement could be placed directly on the pedestals.

To insure that the reinforcement would be effective in carrying a portion of the column load, three tiers of shelf angles were riveted to the old columns as a definite means of accomplishing the transfer of the load. In addition a short section of 80-lb. rail was inserted through the column as shown in the drawing. The concrete jacket was also thoroughly reinforced for column stress with hoops made of ½-in. corrugated bars. These of necessity were in two halves, so they were provided with adequate laps to develop the strength of the bars.

Precautions were taken to insure that the steel work was thoroughly cleaned before the shelf angles were applied or the concreting was done. Naturally it was very important that no voids be left in the concrete on the undersides of the shelf angles and with this in mind the forms were built with sections jointed at the levels of the three tiers of angles. However, the concrete for each column was poured in one continuous run. The drawings show how the concrete was finished on a slope of 45 deg. both inside and outside the steel columns so as to leave no gutters or crevices for the accumulation of water. This work has been carried on under the direction of B. R. Leffler, bridge engineer of the New York Central, Western Lines, Cleveland, Ohio.

WHAT DANIEL WILLARD THINKS OF IT*

IF THE RATE increase just granted by the commission produces the effect which I am firmly convinced it will produce; that is to say, if it will bring about renewed activity in the development of our railways, with renewed and vigorous energy and effort on the part of the railway officers and employees, which will be reflected in the movement of an enlarged volume of business, then the rate advances instead of tending to increase still further the cost of living, will have just the opposite effect and that is exactly what I expect to see happen.

If the railroads under private ownership and operation, and with a basis of rates sufficient to yield an adequate income, are able to satisfy the public—if, in short, they are able to demonstrate definitely that private ownership and operation of the railroads under such conditions not only provides the public with better transportation but in the long run with cheaper transportation than can be looked for under any other system—then I have no doubt that the people will be satisfied with the present system.

Fortunately, also, and by virtue of the agencies provided in the Transportation Act, the wages of railway employees have been adjusted in conformity with the requirements of the Act. This also should be reflected in improved operations on the part of the carriers.

We have, therefore, two results from the Transportation Act:

(1) An adjustment of railway wages which ought to be, and I believe will be, generally accepted as fair by the railway workers; and

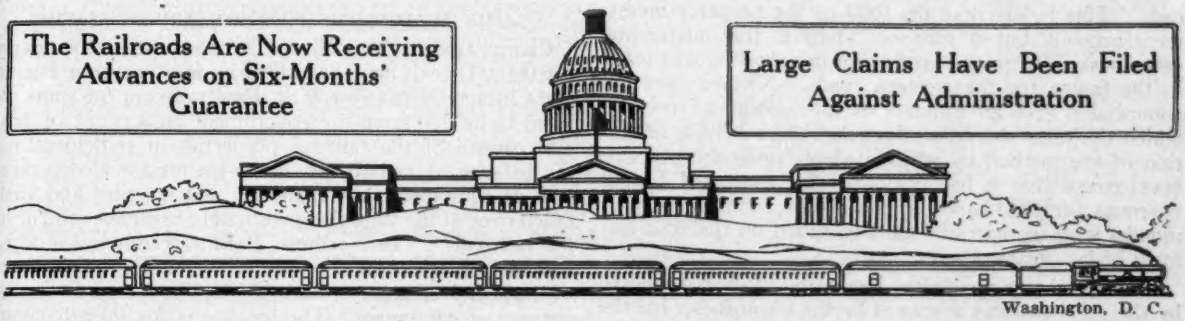
(2) An adjustment of railway rates and charges in harmony with the standards provided by the Act, which should, and I believe will, tend to ultimately bring about the restoration of railway credit.

*Abstract of a statement issued at Chicago on August 1.

INCREASED RATES AUTHORIZED BY I. C. C.

The Railroads Are Now Receiving Advances on Six-Months' Guarantee

Large Claims Have Been Filed Against Administration



Washington, D. C.

THE MOST important development affecting the railroads this year, since the passage of the transportation act and the return of the roads to private management, was the decision of the Interstate Commerce Commission handed down on July 31 authorizing general increases in freight and passenger rates which it is estimated will produce an increase in revenues of $1,546,000,000 a year if applied to state as well as interstate traffic. The increases were intended to be sufficient to enable the railroads to pay the increases in wages recently awarded by the Railroad Labor Board, amounting to something over $600,000,000, and to increase the net operating income of the carriers, which has been almost wiped out by previous wage increases and other increases in expenses to 6 per cent on a valuation of $18,900,000,000, which would be $1,134,000,000 a year, or slightly more than the roads earned in 1916, their best year. The decision was rendered in about three months from the filing of the original applications of the roads.

The commission has allowed the roads about $100,000,000 less than they asked for, by adopting a temporary valuation for the purposes of the rate case about $1,700,000,000 less than the property investment account of $20,600,000,000 on which the roads based their applications. The original application of the roads was for $1,018,000,000 and a supplemental application for $626,000,000 to meet the wage award, of which about half was proposed to be raised by increases in passenger fares, was filed on July 22. The commission allowed the 20 per cent increase in passenger and baggage rates and the 50 per cent surcharge for Pullman passengers proposed by the roads, but made the increase on milk traffic 20 per cent instead of the percentages proposed for freight. On freight traffic it allowed practically the amount asked for except for the roads in the Southern district, that asked for an increase of 38.91 per cent and were allowed only 25 per cent, because the commission found that these roads had been earning during the early months of 1920 a larger net operating income than had been expected from the estimates based on last year's results. The eastern roads, that applied for 39.75 per cent on freight, were allowed 40 per cent. The western roads as a group asked for 32.03 per cent, but the commission placed the lines west of the Colorado common points in a separate Mountain-Pacific group, which it allowed 25 per cent and gave the roads in the rest of the western territory 35 per cent.

These percentage increases, the commission found, should enable the roads to earn the 6 per cent return under present conditions and are predicated upon the assumption that the volume of traffic will be approximately the same as that for the year ending October 31, 1919, which the roads took as a basis for their estimates (after making adjustments for known increases in expenses), except in the case of the Southern roads which the commission found were enjoying a large increase in traffic. The decision also assumes that the roads as a whole could have made a net operating income of about $200,000,000 without the wage or rate increases, as this was the result for the test year, ending October 31, 1919, after making the adjustments.

Arrangements have been made for putting the new rates into effect on August 26, under special permission orders issued by the commission to authorize the roads to file special blanket supplements to their existing tariffs and to complete the revision of their tariffs later. Applications have been filed by the roads with the various state commissions for permission to put into effect for state traffic the same percentages of increase as were authorized by the Interstate Commerce Commission for interstate traffic. Some of the state commissions have already granted such permission, but several have authorized smaller percentages and many, in states which have two-cent fare laws, have held up the proposed increases in passenger fares. This means that a period of protracted litigation is to follow because the roads will appeal to the Interstate Commerce Commission and to the courts to protect them from the reduction in the anticipated increases in revenues and to remove the discriminations in rates which would result from a lower level of state rates. An application was made to the Canadian railroad commission for authority to apply the percentages of increase on joint rates from points in the United States to Canada and from Canada to the United States and it was promptly granted.

A large part of the reduction under the amounts asked by the railroads results from the decrease of the percentage on freight traffic for the Southern district. The Southern roads asked for a total of about $190,000,000 and received about $140,000,000.

The new division of the western lines makes it difficult to calculate the effect with anything like exactness without an analysis of the freight earnings of the individual lines, but it is estimated that the average for the western lines will amount to nearly as much as the 32 per cent which they ask. The Southwestern lines at the time of the original application asked that they be treated as a separate group and allowed an increase of 32 per cent when the western lines as a whole were asking for 24 per cent on freight, but they did not file a supplemental application after the wage award.

The commission said that the eastern roads had apparently been "conservative" in estimating their revenue needs, that the southern roads had "substantially overestimated" theirs and that the roads west of the Colorado common points are as a whole in a substantially better condition than other carriers in the western territory, while the rates in that region are already higher than in the territory east thereof.

The commission gives no explanation of the processes

by which it determined the approximate temporary valuation; simply saying that its figures had been arrived at "from a consideration of all the facts and matters of record." This is less than the total of the property investment account, but is sufficient to cover the outstanding securities. The greatest reduction in valuation was made in the figure for the western roads. Neither does the commission give an estimate of the amount of revenue which the rates should produce and there is little indication of the method by which it determined the percentages except that it has compared the estimated freight revenues for 1920 based on the results for the first four months with the carriers' exhibits based on the readjustment of last year's figures.

The percentage method of increasing rates as proposed by the railroads was approved by the commission for the purposes of this case in view of the emergency and it declined to make the exceptions asked by various shippers as to particular commodities, although it expects that necessary readjustments will be worked out as promptly as possible.

The commissioners were unanimous as to the increases to be allowed, although Commissioners Eastman and Woolley joined in a concurring opinion objecting to the method adopted by the commission in reaching its conclusions.

ROADS RECEIVING ADVANCES ON SIX MONTHS' GUARANTEE

It is roughly estimated that the government will owe the railroads after September 1 about $500,000,000 or $600,000,000 on account of the six months' guaranty provided in the transportation act of one-half of the standard return which was allowed them as rental for the period of federal control, less the amount of the advances being made from time to time on account of the guaranty. The Interstate Commerce Commission has received some 200 applications for advances and has issued 163 certificates to the Treasury Department for the payment of advances amounting to about $100,000,000. Some roads have received more than one certificate. The advances are made by the Treasury Department on the certificates furnished by the commission after the roads have executed contracts and furnished security in accordance with regulations prescribed by the Treasury Department. The first applications were for cash to meet interest and dividend payments and in some cases operating expenses, as many of the roads have had deficits throughout the year, but recently there have been many for the purpose of meeting the retroactive wage payments back to May 1, provided for in the award of the Railroad Labor Board.

The guaranty for the six months' period is about $450,000,000. Up to July 1 the roads as a whole had earned practically none of this and while July and August are expected to show somewhat more favorable results, the most the roads could possibly earn in those months would fall far short of paying the retroactive wage increases, which from May 1 to September 1 will amount to about $200,000,000.

The government also owes the railroads large sums on account of the rental which accrued for the 26 months of federal control. The total compensation paid to the roads by the Railroad Administration up to July 1 on account of rental was $1,365,870,037, of which $13,558,350 was paid in June and $16,788,419 in July. The total standard return for the 26 months amounts to about $1,950,000,000, so that about $585,000,000 was unpaid by July 1. A large part of this is not expected to be paid, but is being offset against what the roads owe the government for capital expenditures made for their account during the period of federal control, and a part is being withheld to protect the government in its claims against the railroads pending a final settlement of the accounts.

CLAIMS AGAINST THE RAILROAD ADMINISTRATION

Claims against the Railroad Administration for nearly $26,000,000 each have been filed by the Northern Pacific and Chicago, Milwaukee & St. Paul railways for sums alleged to be due from the government on account of federal control of the railroad properties in settlement for the balance of rental due, under-maintenance, depreciation of equipment, and materials and supplies and cash taken over at the time the government assumed control of the railroads. The Northern Pacific's claim is for $25,796,397, of which $8,597,394 is for under-maintenance of way and structures, and $7,741,379 for under-maintenance of equipment. The balance is for miscellaneous items. The claim of the Chicago, Milwaukee & St. Paul is for $25,900,968, of which approximately $16,000,000 is for equipment. Only a few of the larger roads have been able to put their claims in shape for presentation for final settlement with the government, although several of the smaller companies have done so. Many of the larger systems have stated that they will not be able to compile all the statistics on which their claims are based for several months. In all, 27 railroad and transportation companies have filed their final claims, including the Pullman Company, the Clyde and Mallory steamship lines, the Seaboard Air Line, Western Pacific, the Virginian, the New York, Ontario & Western and the Spokane, Portland & Seattle. A final settlement has been made with the latter and it has received its money in the form of a check for $1,600,000 as a lump sum payment and the Clyde and Mallory companies have settled for a lump sum of $4,019,787 in addition to previous payments on account. The Pullman Company claim is the largest which had been received before those of the Northern Pacific and the Chicago, Milwaukee & St. Paul. It covers $24,422,264, of which about half represents compensation for the use of its car line property and the balance represents depreciation, materials and supplies and cash.

PROPOSED CAPITAL EXPENDITURES FOR 1920

Capital expenditures for additions and betterments and new equipment during 1920 to the amount of $762,256,108 had been authorized or proposed by 122 Class I railroads before the rate decision was announced. This figure was compiled from replies received by the Interstate Commerce Commission in response to a telegram sent to the roads in connection with the disposition of the $300,000,000 loan fund, as to the probable expenditures to be substantially completed during 1920. The telegram was sent by Alfred P. Thom, counsel and vice-chairman of the Association of Railway Executives, on March 20, but the compilation published herewith gives a summary of the information furnished by the roads up to July 1.

The table given herewith represents replies from 54 eastern, 19 southern and 49 western roads. They were asked to state the proposed expenditures under the different classifications shown in the table which had been authorized or substantially decided upon, but the replies indicated various degrees of definiteness as to the different items, as many roads had not yet definitely determined upon their budgets and many had made plans contingent upon their receiving loans from the $300,000,000 fund provided by the transportation act. Therefore, in some cases the items represent specific authorizations and in other cases the estimates of the railroad officers of their minimum requirements and it is regarded as probable that in many cases the amounts proposed will be increased as a result of the rate decision, but in any event the figures represent work which the roads consider it

highly desirable to complete this year. The summary of the information furnished up to July 1 is as follows:

FINAL SUMMARY OF REPLIES RECEIVED BY THE INTERSTATE COMMERCE COMMISSION IN RESPONSE TO REQUEST FOR INFORMATION REGARDING AUTHORIZED AND PROPOSED CAPITAL EXPENDITURES TO BE SUBSTANTIALLY COMPLETED DURING THE YEAR 1920.

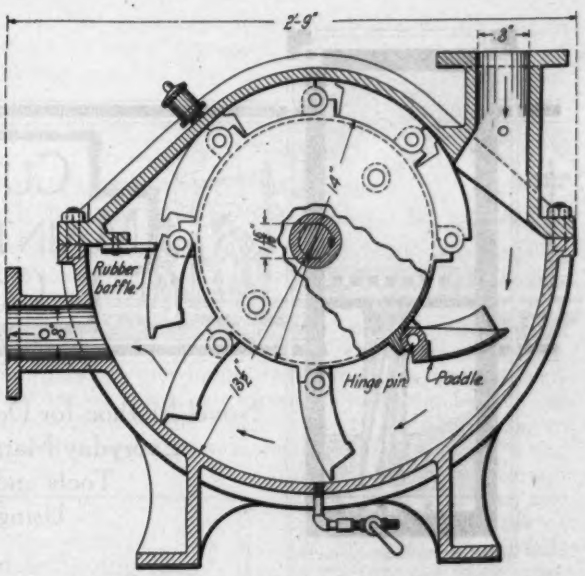
	Item	Eastern District	Southern District	Western District	United States
1.	Additional main tracks	$ 9,857,669	$ 1,493,850	$ 11,661,253	$ 23,012,772
2.	Additional yard tracks and sidings	23,252,029	3,791,112	15,440,110	42,483,251
3.	Signals and interlocking plants	3,897,696	316,944	2,553,116	6,767,756
4.	Shops	21,979,435	5,207,055	16,668,918	43,855,408
5.	Station and station facilities	4,377,089	2,345,635	9,725,266	16,447,990
6.	Extensions and branches	3,099,844	512,322	2,763,916	6,376,082
7.	All other road improvements	62,101,761	13,821,133	77,542,929	153,465,823
	Road expenditures not itemized	.....	.....	.....	.....
	Total—Road	128,565,523	27,488,051	136,355,508	292,409,082
8.	Locomotives	46,041,564	11,511,045	48,063,557	105,616,166
9.	Box cars	42,165,896	5,962,071	49,131,633	97,259,600
10.	Open top cars	40,508,475	3,956,175	21,672,500	66,137,150
11.	Refrigerator cars	4,995,000	4,762,500	15,130,000	24,887,500
12.	Other freight train cars	5,616,401	2,089,836	15,567,318	23,273,555
13.	Passenger coaches	24,979,475	3,267,606	7,532,765	35,779,846
14.	Other passenger train equipment	7,318,120	1,699,746	5,378,061	14,395,927
15.	All other equipment—new	3,409,769	682,851	8,259,689	12,352,309
16.	Improvements to existing equipment	25,204,347	2,009,991	17,663,435	44,877,773
	Equipment expenditures not itemized	600,000	7,723,000	1,237,000	9,560,000
	Total — Equipment	200,839,047	43,664,821	189,635,958	434,139,826
	Expenditures not separated between Rd. and equipment	35,707,200	.....	.....	35,707,200
17.	Total	$365,111,770	$71,152,872	$325,991,466	$762,256,108

A RECENT DEVELOPMENT IN WATER SOFTENING EQUIPMENT

ONE of the most essential features of a water treating plant of the continuous type is a chemical measuring device that will be accurate, automatic, reliable and of sturdy construction. These attributes are of more importance in this than other machinery because the class of men employed as pumpers cannot always be relied upon to make adjustments or to look after delicate apparatus. As implied by the term—continuous softener—the chemicals must be introduced in proportion to the flow of water, and it has been difficult to devise a measuring apparatus that will give proportionate results for small as well as large flows of water.

These considerations led M. D. Miller, president of the Railroad Water & Coal Handling Company, Chicago, to make studies of a volumetric water motor as a means of operating the chemical pump in direct proportion to the flow of the raw water, it being the idea that a water motor in which each revolution was dependent on the passage of a fixed volume of water would give uniform results irrespective of the rate of discharge.

Accordingly a motor of this character was developed in the form shown in one of the drawings, which consists of a flat, vertical chamber 5 in. wide which contains a drum 14¼ in. in diameter, mounted on a 1 1/16-in. shaft and arranged to revolve within the chamber with a minimum of clearance from the sides. Attached to this drum on its circumference are eight paddles mounted on pivots so that they will take the various positions shown under the influence of the force of gravity in the course of the revolution of the drum. It is readily seen that when water is admitted through the pipe connections in the upper right corner the drum will be caused to revolve,



Cross Section Through the Water Motor

and that with the paddles designed to give a very small clearance from the walls of the chamber there is a fixed relation between the volume of water passing through the motor and the number of paddles passing a given point. In other words, the number of turns of the drum is directly proportionate to the volume of water passed except for the effect of leakage and clearance.

As a means of checking the accuracy of the motor, it was subjected to a series of tests to determine its performance under conditions which corresponded as closely as possible to those of actual service. The motor was set up in series with a centrifugal pump and a water motor with a discharge pipe at sufficient elevation to

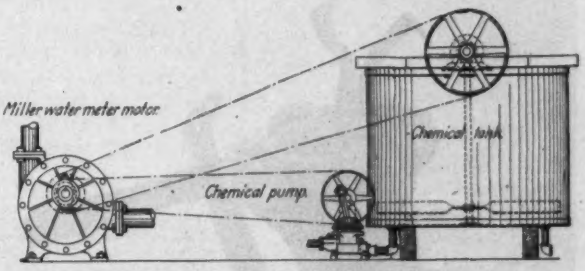
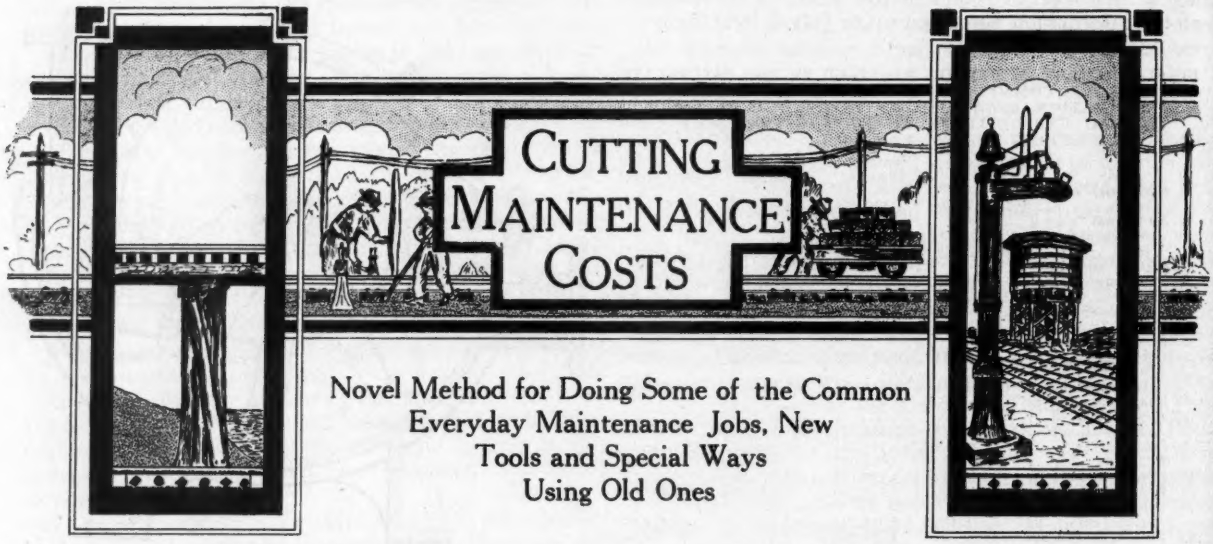


Diagram Showing Arrangement of Apparatus for Tests

give approximately the same head obtained in water softening practice. The second drawing shows how the chemical pump and the agitator of the chemical tank were driven from the water motor by sprocket chains. Data were taken on the number of revolutions of the water motor, the quantity of water passing through it and the amount of chemicals pumped into the chemical tank, while different runs were made with the apparatus on various rates of discharge.

Based on the results of these tests, it is the conclusion that the motor is accurate within a 100 per cent variation in the rate of discharge; thus, a motor with a rated capacity of 150 gal. per min. gives equally accurate results at 100 gal. or 200 gal. per min. These water motors are now incorporated in the equipment of water softeners built by the Railroad Water & Coal Handling Company.



CUTTING MAINTENANCE COSTS

Novel Method for Doing Some of the Common Everyday Maintenance Jobs, New Tools and Special Ways Using Old Ones

A PORTABLE SPIKE STRAIGHTENER

A SMALL machine to straighten spikes that is adaptable to use by section gangs either in the tool house or out on the track has been developed and put on the market by the Werner Machine Company, 7606 National Avenue, West Allis, Wis., under the name of the "Butler Spike Shaper." The character of the device is readily seen from the photograph. It consists of a frame supporting two jaws arranged to come together through the agency of a pair of links and an eccentric operated by a lever. The positions of this lever are controlled by a quadrant having teeth which engage the lever so that the jaws may be held a fixed distance apart. The jaws contain grooves in the adjacent faces to hold the spikes

The Butler Spike Shaper

which are straightened, not by bringing the jaws together by means of the lever, but by forcing the spikes downwards between the jaws with a maul while the jaws are held at a fixed distance apart.

The machine weighs approximately 70 lb. and is made in two types, one with solid jaws and the other with interchangeable dies fitting into the jaws. The machines are also made for two different sizes of spikes, 9-16 in. by 5½ in. and ⅝ in. by 6 in.

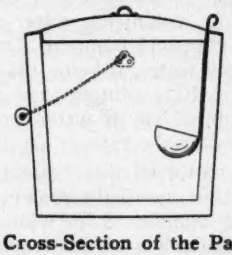
The manner of operating the machine is as follows: The operator picks up a bent spike with one hand and with the other raises the lever which opens the jaws. He then places the spike in the groove prepared for the given size of spike and closes the jaw by lowering the lever, locking it with the catch. After that he takes a hammer or spike maul and strikes the spike on the head the same as he would if he were driving it into a tie. After the spike has been driven full length the lever is raised and the spike is released, properly straightened. It is stated by the manufacturers of this machine that 1,000 spikes may be straightened with it by one man in eight hours. Attention is also directed to the fact that the operation of this machine does not require the same degree of skill demanded for operating a spike straightener of the hammer type and also that the opportunity for accidents is much less. Fifty of these machines are now in use on the Chicago & North Western, while some 12 other roads have also purchased them.

AN INSULATED DRINKING WATER PAIL

By C. S. Lusk
Section Foreman, Erie, Alfred, N. Y.

ONE OF THE difficult problems in the summer time is to keep section gangs supplied with cool drinking water. On many sections it is necessary to carry the water long distances and when it does arrive about one drink is all that is palatable, because the water gets warm so quickly.

As a means of keeping the drinking water at a proper temperature for a longer time, I have devised a special



Cross-Section of the Pail

form of water pail in which the water is protected by a dead air space. For this purpose I use two sizes of buckets, say 10-qt. and 12-qt., placing the smaller one inside the larger and have a tinner cut a rim large enough to lap over the edges of the two buckets. This rim should be made to incline slightly toward the outside for drainage. This rim should be carefully soldered to the two pails so as to leave a dead air space

between the bottoms and sides of the inner and outer buckets. A metal cover following the same plan completes the equipment and serves to insulate the water completely except that the cover must have a slot to fit the end of a flat handled dipper, but by winding friction tape on the dipper handle, a very close fit can be made. The pails and cover are best made of galvanized iron; the bail of the pail should be made of heavy wire and have a wooden hand piece.

PLATFORMS FOR TIE TAMPERS

By G. T. DONAHUE
Assistant Supervisor of Track, New York Central, Rochester, N. Y.

AS MECHANICAL tie tampers are gradually coming into use and as they have to be removed from the track about every 500 ft. on account of the limit on the length of hose, it is necessary to provide supports for them. The banks adjacent to the tracks from which they have to be taken are usually irregular as to width and height. This makes it necessary to build up cribs and platforms conforming to the topography of the road. It is the usual custom to build these out of old ties, which are very unsightly. They have to be rebuilt from time to time, they often catch on fire and they are generally unsatisfactory.

For this reason it is a good idea to build permanent rests for the tampers from waste cinders. They should be built to the proper width and height so that the machine can be skidded off level with no loss of time and without having to rebuild a new platform every year. Two old ties placed in cinders perpendicular to the track will give a good foundation to hold the machine.

Five Dollars for a Labor Saving Idea

Are you reading the suggestions for cutting maintenance costs that have appeared in the last three issues of the *Railway Maintenance Engineer*? If you are, are you learning anything from the suggestions made? Perhaps the methods proposed recall to mind labor-saving kinks which you have put into practice and which you believe to be superior. If they have helped you, you can be sure that they will help others. If you have developed any labor-saving device, any supplementary use for equipment other than that for which it was intended or any other plan for saving labor, the *Railway Maintenance Engineer* desires an opportunity to publish an account of it. We will pay $5 for each meritorious idea or description of this character which is not generally known or used and which has not been described previously in these columns or elsewhere. Send such contributions to the editor, 608 South Dearborn street, Chicago.

DRAGGING RAIL THROUGH TUNNELS AND OFF BRIDGES EXPEDITES WORK

By J. MORGAN
Supervisor, Central of Georgia, Goodwater, Ala.

WHEN RELAYING rail through tunnels and on long single-track trestles, it is expensive to string out and lay the new rail and then uncouple and load the old rail owing to the narrow working space and also poor light in tunnels. Where the track is straight I find that the new rail can be coupled together on the roadbed at the end of the trestle or tunnel, dragged to the desired position by an engine and then laid in track cheaper than by laying one rail at a time as in the open track. In all cases we throw the old rail outside of the track before we drag it out into the open. I have found it possible to drag a string of 70 90-lb. rails out of a tunnel and as many or more from a trestle in so short a time that no charge is usually made for the engine service. I recently dragged 160 rails out of a tunnel in this way in a half hour.

DIVIDING WORK OF SPIKING EXPEDITES RAIL LAYING

By WILLIAM MARNOCH
Yard Foreman, Atchison, Topeka & Santa Fe, Needles, Cal.

IN RELAYING rail I have found that greater progress is made in gaging and spiking the track by dividing this work equally between four sets of gagers. The work is also done more uniformly and neatly. Each set of gagers is numbered and the man who places the expansion shims in the joints marks the rails consecutively from one to four to correspond with the numbers on the gages carried by the spikers. In this way it is easy to determine who the slackers may be, if there are any, and at the same time ascertain those responsible for any poor work. If any one of the four sets of men fails to perform the work properly I transfer the men to the tong gang or the claw bars as a disciplinary measure, as this work is conidered to be hardest in a steel gang. As a result the other gagers strive harder than ever to do their work properly.

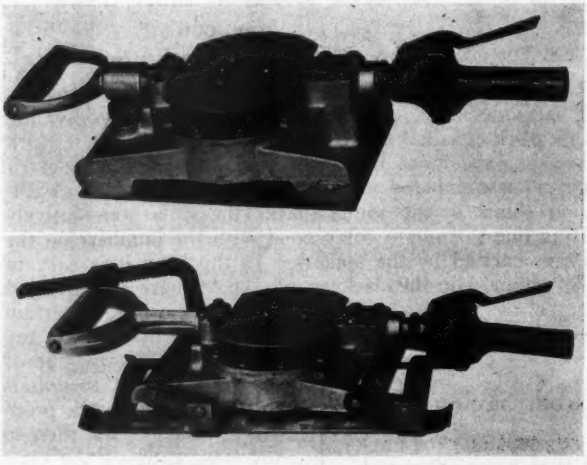
PNEUMATIC ADZING TOOLS

A NEW TYPE of pneumatic tool is now being offered to the railways for doing all manner of work commonly done by bridge carpenters with jack planes, adzes, draw knives and hand chisels. The machines are adapted for adzing ties and one form is especially designed for peeling the bark from poles or piles.

The basic feature of this machine is a turbine designed for operation by compressed air. The cutting knives are attached directly to the turbine frame so there are no valves, connecting rod gears and the like, there being but the one moving part and that mounted on ball bearings. The illustrations show the upper side of two of these machines which comprise aluminum frames for supporting the turbine and cutter on a shaft perpendicular to the plane of the work. There are two handles, one of which forms a part of the air inlet and is fitted with a valve to control the flow of the air. The cutter head holds two high-speed steel blades so attached that they may be released readily for sharpening. They are made adjustable to permit them to be moved up as they are ground down. The machines are provided with a shoe on which it slides over the wood surface, the shoe being made adjustable by means of a lever or a thumb screw to control the depth of the cut. The cutters revolve at a speed varying from zero to 6,000 r.p.m. The best results are obtained with an air pressure of 100 lb.

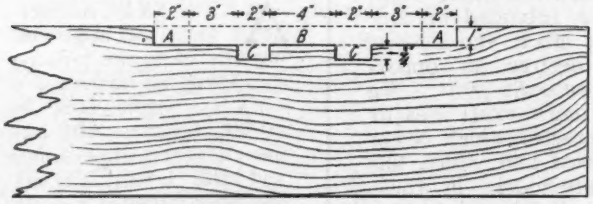
per sq. in. and each machine requires approximately 40 cu. ft. of free air per minute.

As would be expected, these machines work much faster than one can proceed with hand tools. In some classes of work one man with a machine has been able



Two Styles of Planer as Designed for Flat and Curved Surfaces

to do as much as ten men cutting by hand. It is also found that a man may become skilled in the use of one of these air tools in a fraction of the time it would require to learn the proper use of such tools as an adze. The manufacturers also state that the air planer does better work, particularly on rough, cross-grain wood, than can be done with the hand plane. The work is more



Type of Gaining Work Done with the Adzing Tool

uniform and is not so readily spoiled when passing over knots and rough spots.

The American Bridge Company has purchased some of these planers for dapping bridge ties and the drawing shows a typical cut of this kind which was made in 1 min. 55 sec. These machines are manufactured by the Turbine Air Tool Company, Cleveland, Ohio, and were subjected to extended use in the course of the wooden-ship-building program of the war period.

PREVENTING SWITCH POINTS FROM RUNNING

BY GEO. T. DONAHUE

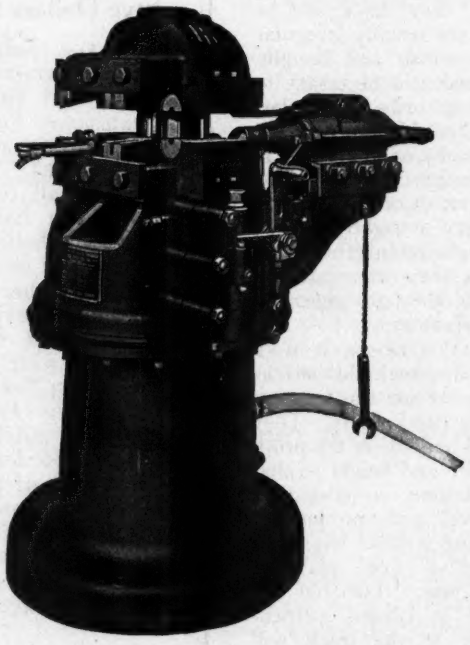
Assistant Supervisor of Track, New York Central, Rochester, N. Y.

A PERSON familiar with rail anchors and who has followed them closely in the field has noticed that although the anchors are up against ties when put on, the next morning they will be quite a distance away from these same ties. This is due to the fact that the rail contracts during the cool hours of the night and is its shortest about seven o'clock in the morning, at which time the anchor will be at its maximum distance from the tie. This distance will vary with localities, but I have seen it from ¾ in. to 1½ in.

If at this time in the cool morning we move these rail anchors up against the ties for a sufficient distance on both sides of the switch points we can eliminate the running of the switches, which is often enough during the heat of the day so as they cannot be locked. This method is particularly effective around interlocking plants and eliminates all switch trouble of this nature. With the one application we save ourselves several adjustments which would have to be made during the season and may prevent possible train delays.

A TOOL SHARPENER

THE INGERSOLL-RAND Company, New York, has introduced a new machine for forge dressing the edges or points of tools which is known as the IR-No. 50 drill sharpener. It is designed for redressing cold chisels, making rivet sets, sharpening hand picks, forming bolt heads, etc. As seen in the illustration it is a compressed



A Machine for Dressing the Edges of Tools

air-operated press and hammer arranged to receive dies that give the desired shape to the edges of the tools, the ends of drill bits, etc.

A single lever controls all the operations of the machine, being fitted with a safety locking device which makes it impossible to operate the machine unless the lock is released. Special attention has been given to the lubrication, which is supplied by the Ingersoll-Rand "Heartbeat" lubricator. This works automatically when the machine is in operation.

A NEW SAFETY PLAN. An innovation for the safety of workmen engaged in construction work has been introduced in the erection of large extensions to the plant of the American Rolling Mill Company at Middletown, Ohio. Each Tuesday a committee composed of foremen, mechanics and laborers inspects the entire job from sewers to roof with the one purpose of seeing that proper methods are taken to safeguard the employees against accident.

THE WATER SUPPLY FOR A LARGE ENGINE TERMINAL

BY FRED D. YEATON,
Assistant Engineer, Chicago, Milwaukee & St. Paul, Chicago, Ill.

THE QUANTITY and quality of the locomotive water supply were important factors in the location of the Chicago, Milwaukee & St. Paul engine terminal at Bensenville, Ill. The general features of this water supply are somewhat unusual, involving five wells, each nearly one-half mile in depth; deep well pumps with the working barrels (water cylinders) placed more than 200 ft. below the surface of the ground; a 100,000-gal. concrete storage reservoir, and a 200,000-gal. elevated steel service tank. This station has now been in use nearly two years and has given excellent service.

The engine terminal is a very important adjunct of a large freight classification yard of the St. Paul, located about 17 miles west of Chicago on the Chicago and Council Bluffs division, where it serves not only as a terminal for freight trains on that line but also, through a belt-line connection, as a terminal for through freight trains on the Chicago and Milwaukee division. The freight yard comprises some 95 miles of track and the engine terminal includes a 30-stall roundhouse and other corresponding facilities.

No streams, surface water or shallow well water was available near Bensenville, so it was necessary to resort to deep well water, which affords good quality and a quantity that is more than sufficient to meet the future demands. The water contains less than 15 grains per U. S. gallon of incrusting solids, 10 grains of which are calcium and magnesium carbonates that form a soft scale. The non-incrusting solids amount to only three grains. The static level of the water was about 65 ft. below the surface of the ground when the wells were drilled, but is now considerably lower.

During busy periods the maximum demand for water has been as high as 900,000 gal. per day and an average of 750,000 gal. of water is required. The following is a typical record from January 3, 1920, to February 7:

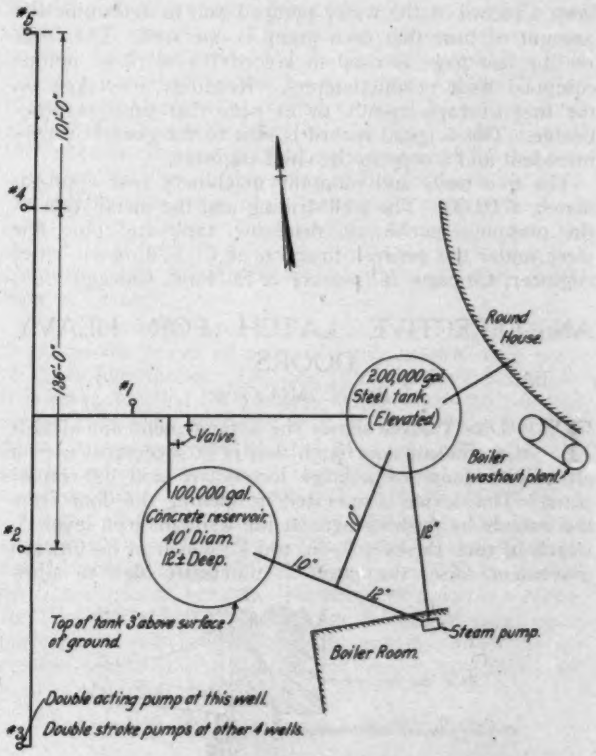
Well No.	Average Gallons Pumped Per Day	Capacity of Pump Per Day
1	67,074	162,288
2	253,177	350,813
3	238,185	296,842
4	171,845	377,798
5	95,387	310,335
	825,665	1,498,076

To provide for future requirements the plant is designed to handle 1,500,000 gal. in 24 hr. If the demand ever reaches the capacity of the plant, it is the intention to drill additional wells.

The wells are spaced about 100 ft. apart and vary in depth from 2,201 to 2,290 ft. The diameter of the top of each well is 12 in. and at the bottom 6 in. The lower half of the wells is uncased.

The pumphouses are of fireproof construction and are provided with a concrete floor and gallows frame to aid in removing the working barrels, drop pipe and sucker rods. The piping is arranged so that water can be pumped into either the reservoir or the elevated tank. There are three telescopic water columns, and fire hydrants and gate valves are located at convenient locations. The valves that control the fire main are marked.

Four of the wells are pumped by double-stroke, geared pumps and the other by a double-acting deep-well pump.



How the Wells and Facilities Were Arranged

The working barrels of the double-stroke pumps are 8¾ in. in diameter by 18 in. stroke (36 in. displacement) and are placed 247 ft. below the surface of the ground. The working barrel of the double-acting deep-well pump is 7¾ in. in diameter by 24 in. stroke, and is placed 200 ft. below the surface. More reliable service has been ob-

RECORD OF PERFORMANCE OF PUMP NO..... at .....
Date of last previous reading.....Month .....Day .....
Date of this reading.....Month .....Day .....
Dial numbers recorded at this reading.....
Dial numbers recorded at last previous reading.....
Revolutions made between these two readings.....
Gallons per revolution (plunger displacement).....
Total gallons pumped.....Average gallons per day.....

DESCRIPTION OF PUMP

Type of Pump.....Make .....
Number of Cylinders.....Diameter of cylinder.....in.
Single or double acting.....Length of stroke.....in.
Height—Pump Head to top of tank.....Revolutions per minute.....
Depth—Pump head to bottom of cylinder.....Capacity per minute (plunger displacement).....gal.
Suction lift.....Maximum capacity of pump in 24 hours (plunger displacement).....gal.
Size of suction or drop pipe.....Maximum capacity of pump in 30 days
Size of discharge pipe..... (plunger displacement).....gal.

tained from the double-stroke than from the double-acting pump. The pumps are driven by 20-hp. direct-current motors, using 220-volt current and operating at 1,100 r. p. m. The pumps are operated at about 25 per cent less than the rated speed because experience has shown that more reliable service is obtained at the lower speed.

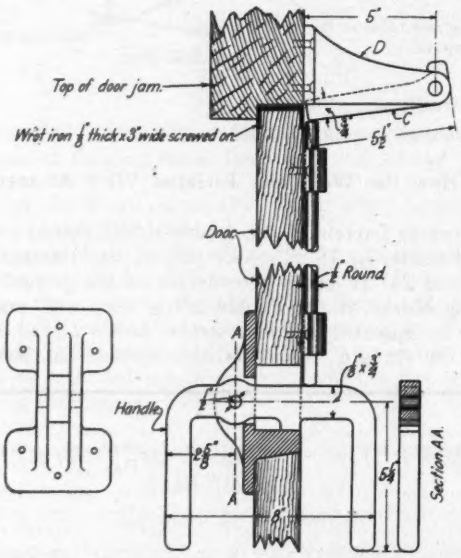
To provide adequate water storage at the terminal, the 200,000-gal. steel elevated tank and the 100,000-gal. concrete storage tank have been installed at locations near the engine house. There is a steam pump in the power house which can be used for rehandling the water from the reservoir, pumping it direct into the elevated tank or into the supply mains as needed. Productimeters (revolution counters) have been placed on each pump, to keep a record of the water pumped and to determine the amount of time that each pump is operated. The form on the last page is used to record the work of pumps equipped with productimeters. Readings are taken on the first of each month, or as near that time as practicable. The original record is sent to the general superintendent and a copy to the chief engineer.

The five wells and pumping machinery cost approximately $60,000. The well drilling and the installation of the pumping machinery, reservoir, tank and pipe line were under the general direction of C. F. Loweth, chief engineer, Chicago, Milwaukee & St. Paul, Chicago.

AN EFFECTIVE LATCH FOR HEAVY DOORS

By N. McCleod

THE DRAWING shows the arrangement and details of a efficient door latch that is in successful use on all of the doors of a large locomotive and car repair plant. The device is operated in opening the door from the outside by pushing against the wrought iron lever A, which in turn raises a ½-in. rod B, which in its upward movement raises the catch C sufficiently high to allow



Outline Drawing of the Door Latch

the door to pass under it in opening. The catch C, being heavy and swinging on a ½-in. pin passed through casting D, allows the door to be locked automatically by gravity, C dropping downward far enough to intercept the door and hold it. To open the door from the inside a pull or lift on the handle A repeats the operation described and brings the door open with the pull. The latch operates equally well in slamming the door shut.

American Railway Engineering Association

A. R. E. A. Bulletin, No. 227, which was mailed recently to the members contained a number of valuable papers, including one on substitute ties which appears in abstract elsewhere in this issue. Material for another bulletin is now in preparation. The work of the various committees is being pursued diligently. The Committee on Iron and Steel Structures held a two-day session at Montreal on August 12 and 13, the Masonry Committee held a meeting in New York City on August 24 and the Committee on Economics of Railway Operation in Chicago on August 20. Most of the recent activities have been meetings of the sub-committees held at points most convenient to the personnel.

Master Painters' Association

Plans for the convention of the Maintenance of Way Master Painters' Association at Detroit on October 5, 6 and 7 are being brought to completion, nearly all of the details of the program having been completed, as evidenced by the outline given below:

Tuesday, October 5, 9:30 A. M.

Call to order, followed by invocation, address of welcome, president's address and report of secretary-treasurer.

Memorial to the late A. J. Miller, master painter, Atchison, Topeka & Santa Fe.

Opening of the question box.

Tuesday, 2:00 P. M.

Report of Committee No. 1 on "Economy in Handling Tools and Equipment," C. Collenberg, master painter, Union Pacific, Cheyenne, Wyo., chairman.

"Painting or Frosting Glass in Office Windows, to Save Cost of Window Shades," by L. T. Hornbuckle, master painter, Wabash, Decatur, Ill.

Address by Mr. Hallet, National Lead Company.

Lecture and demonstration of scaffolding.

Wednesday, 9:30 A. M.

Report of Committee No. 2 on "Fire Retardant Coatings," H. B. Wilson, master painter, Bessemer & Lake Erie, Greenville, Pa., chairman.

"Painting Bridges for a Third of a Century," by Charles Evan Fowler, consulting bridge engineer, New York City.

Paper on Spray Painting.

General discussion on use of motor cars by maintenance of way painting gangs.

Paper by representative of Detroit Graphite Company.

Stereopticon lecture by D. Louis Ireton, chairman, International Trade Development committee, New York City.

Report of Committee No. 3 on "Efficient Painting of Iron and Steel Structures," Henry Crooks, master painter, Pittsburgh & Lake Erie, Pittsburgh, Pa., chairman.

Thursday Morning, 9:30 A. M.

Lecture by H. A. Gardner, director, Institute of Industrial Research, Washington, D. C.

Report of Committee No. 4 on "Advantages and Disadvantages of Using Boarding and Camp Cars," C. E. Fife, master painter, Atchison, Topeka & Santa Fe, Amarillo, Tex., chairman.

Lecture and demonstration by G. F. Johnson, Pyre Non-Paint Company, New York, N. Y.

General discussion, "Keeping the Men Employed the Year Round."

Thursday, 2 P. M.

Paper by representative of Wolfe Brush Company, Pittsburgh, Pa.

General discussion on co-operation and organization and get together meetings of foremen and men.

Exhibits of photographs of interesting and difficult work.

Questions answered.

Closing business.

AMERICAN WOOD-PRESERVERS' ASSOCIATION

The American Wood-Preservers' Association has given its approval to the suggestion of George M. Hunt of the Forest Products Laboratory for an extended study of the protection of piling from marine borers and has appointed a special committee to represent the association in this investigation, this committee consisting of Walter Buehler (The Barrett Company), New York, chairman; R. J. Calder (International Creosoting & Construction Company), Galveston, Tex.; E. M. Blake (Charles R. McCormick & Co.), San Francisco. Another committee was appointed to study the marine borer problem from the standpoint of the conditions as developed recently in the vicinity of San Francisco, this committee consisting of F. D. Mattos (Southern Pacific), West Oakland, Cal., chairman.

ROADMASTERS' ASSOCIATION

The program for the convention is now completed. In addition to those papers and reports contained in the program published in the last issue, R. H. Howard, chief engineer maintenance of way of the Wabash, will present a paper on "The Maintenance of Track Joints" on the afternoon of the opening day. Also in addition to the joint session with the St. Louis Railway Club on Tuesday evening, the latter organization is planning to present a program on Thursday evening to which a special invitation will be extended to the members of the Roadmasters' Association.

Practically all of the space available for exhibits has been allotted to applicants by the Track Supply Association and the indications are that the number and variety of exhibits will exceed that of any previous year. Two additional names have been added to the list of firms to be represented, namely, the Duff Manufacturing Company, Pittsburgh, Pa., and the Lackawanna Steel Company, Lackawanna, N. Y.

BRIDGE AND BUILDING ASSOCIATION

The arrangements for the convention which will be held at Atlanta, Ga., on October 26-28, are now rapidly assuming shape. The reports of the committees are well in hand and a number of special features are being arranged for. It is expected that arrangements will be made for special cars for the members traveling from Chicago and possibly from New York.

NEW STANDARD WEIGHTS FOR I-BEAMS AND CHANNELS ADOPTED

THE ASSOCIATION of American Steel Manufacturers has announced a new table of standard weights for minimum sections of I-beams and channels. This change was made for the purpose of tabulating the actual weights of the minimum section instead of the nominal weights by which these sections have been designated for the past 24 years. Thus, a 10-in., 25-lb. I-beam will now be designated as a 10-in., 25.4-lb. beam, while an 18-in., 55-lb. I-beam will be an 18-in., 54.7-lb. beam.

In 1896 the association adopted a set of standard profiles of structural steel sections. Fifteen years later it adopted standard methods of computation for published weights and areas, but the weights that were published for the minimum thicknesses of beams and channels did not correspond exactly to the published areas, and it has long been known that it is impracticable to furnish these sections true to both the weights and dimensions.

There is to be no change in the profiles and properties of sections of minimum web thickness, nor in the weights and properties of the intermediate and maximum sections. The new weights are to be put into effect September 1 by all of the companies rolling these sections.

THE MATERIAL MARKET

THE PRESENT material market is influenced by a number of factors: A general falling off of business, particularly in the automobile and building trades, a renewed interest in railroads because of the anticipated impetus given to purchases by the rate advance and the end of the government guarantee period, and the influence of the rate advance on prices. A further factor which has exerted its influence for many months is the general delay in deliveries of materials as a consequence of railroad congestion, coal shortage, etc. The general slackening in business has had a marked influence on the demand for structural steel, although this has not been reflected by any reductions in price. On the other hand, large orders are expected from the railroads for rails and other track materials. The mills have received many inquiries from the roads, but so far no orders for 1921 delivery have been taken by the plants of the United States Steel Corporation, owing to the delay in action regarding the price policy for the next year in the place of the schedule of basic prices now recognized by the corporation. In view of this some of the railroads are making reservations for rollings, leaving the price to be fixed later. The Alaskan Engineering Commission has reserved 6,000 tons on this basis, while the Burlington has obtained space for 20,000 tons in Colorado and 25,000 tons in Chicago.

The increase in rates is going to require some adjustments in the prices of materials, particularly bulk commodities like lumber. Quoting from the lumber dealers, it is estimated that the advance will increase the price of yellow pine from $3 to $6 at New York, from $2.50 to $3 at Chicago and from $1.50 to $3 at St. Louis, while the corresponding advances for Douglas fir and other Pacific coast products are $5 to $8 at New York, $5 to $6 at Chicago and from $4 to $6 at St. Louis. In the case of steel products, the new price differential between Chicago and Pittsburgh will be about 38 cents per 100 lb. instead of 27 cents, as at present. However, this will not represent the full effect of the change in freight rates since basic prices will probably be advanced to cover the increased transportation charges on the ore, coal and coke used in manufacture.

	Price in Cents Per Pound			
	July 20		August 15	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	4.00	3.82 to 4.27	4.00	3.82 to 4.52
Track bolts	6.00	5.17 to 5.27	7.00	5.17 to 5.52
Boat spikes	4.50	4.77	4.50	4.77
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.75	2.75	....	3.00 to 4.00
Tie plates, iron	3.75 to 4.00	3.75 to 4.00	3.75 to 4.00	3.75 to 4.00
Plain wire	3.00 to 4.00	3.27 to 4.27	3.00 to 4.00	3.27 to 4.27
Wire nails	3.25 to 4.25	3.52 to 4.52	3.25 to 4.50	3.52 to 4.77
Barbed wire, galv.	4.10 to 4.95	4.37 to 5.22	4.10 to 5.10	4.37 to 5.37
C. I. pipe, 6 in. or larger (per ton)		$76.80		$76.80
Plates	2.65 to 3.50	2.92 to 3.72	2.65 to 3.50	2.72 to 3.72
Shapes	2.45 to 3.50	2.72 to 3.72	2.45 to 3.50	2.72 to 3.52
Bars (steel)	2.35 to 3.50	2.62 to 4.27	2.35 to 3.50	2.62 to 4.27

The prices for scrap materials have advanced appreciably during the last month after a considerable period of stagnation. Most of the quotations in the table below will be found to be from $1 to $5 higher than those appearing in last months' issue.

	Chicago	St. Louis
	Per Gross Ton	
Relaying rails	$57.00 to $62.50	$50.00 to $55.00
Rerolling rails	37.00 to 38.00	33.00 to 33.50
Rails less than 3 ft. long	29.50 to 30.00	23.00 to 23.50
Frogs and switches, cut apart	24.50 to 25.00	24.00 to 24.50
	Per Net Ton	
No. 1 railroad wrought	$24.50 to $25.00	$22.00 to $22.50
Steel angle bars	25.00 to 25.50	21.00 to 21.50

GENERAL NEWS DEPARTMENT

The Canadian Pacific now has in its employ 18,330 returned soldiers who enlisted in the Canadian, British and United States armies, or more than 20 per cent of the total payroll.

The American Association of Engineers now reports that it has 20,000 members, an increase during the first seven months of 1920 of 9,550. The number of local chapters and clubs aggregate 209.

The Interstate Commerce Commission has ordered Class I railroads to file with it quarterly reports giving particulars of the number of employees of various classes in the service at specified times, of the service rendered by such classes of employees and of the compensation paid for that service.

The Missouri Pacific has granted an increase of approximately 50 per cent to retired employees on the pension roll, beginning with month of July. Under the new provision, those pensioners who have been drawing from $15 to $75 a month will get from $37.50 to $112.50 a month. The increase in cost of living prompted the Board of Directors to take this action.

A National Conference on engineering employment, sponsored by the American Association of Engineers, will be held in Chicago on November 12, for the discussion of industrial relations problems affecting employees and engineers. Employment managers of large industries, employers of technical men and the free employment bureaus will be invited to send representatives to this conference.

That This Country is becoming more and more dependent on west coast forests for its supply of lumber is indicated by the general tendency toward the movement of lumber operations to that field. The Long-Bell Lumber Company, Kansas City, hitherto chiefly a southern pine operator, is planning to erect three mills in the Columbia river territory while the Edward Hines Lumber Company, Chicago, is also seeking locations in the west.

The New York Central has been requested by the New York State Public Service Commission, Second District, to make an experimental installation of some automatic device, the purpose of which shall be to safeguard the trains when they are not so controlled as to prevent collisions and certain classes of derailments, this action being taken on account of the immediate necessity in the eyes of the commission, for additional protection for trains.

Alba B. Johnson, president of the Railway Business Association, has sent to Chairman Clark of the Interstate Commerce Commission a telegram heartily congratulating the commissioners on their promptness and vigor in deciding the rate advance case. The commission is congratulated on carrying out faithfully the purpose of Congress to rehabilitate railroad credit and on its wisdom in fixing the basis of income at six per cent rather than five and one-half per cent.

The Joint Conference Committee of the national societies of civil, electrical, mechanical and mining engineers, has issued an invitation to engineering and allied technical organizations to become charter members of the Federated American Engineering Societies, the organization conference of which was held in Washington, D. C., on June 3 and 4, and the proceedings of which were reported briefly in the *Railway Maintenance Engineer* for June, page 285. The engineering societies are also asked to appoint delegates to the first meeting of the American Engineering Council which will be held this fall and of which more detailed notice will be made later.

American Railway Express Company employees, numbering approximately 75,000, were granted flat increases in wages of 16 cents per hour retroactive to May 1, 1920, by the United States Railroad Labor Board on August 10. The employees affected included the members of the Brotherhood of Railway & Steamship Clerks, Freight Handlers, Express and Station Employees, the International Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers of America, the Railway Express Drivers, Chauffeurs and Conductors of Chicago and the Order of Railway Express Men. It is estimated that the increases in wages provided for in the award will amount to approximately $30,000,000 per year.

The Erie Railroad reports that in the four months ending with June, its ton-mileage, 3,715,892,789 tons, was 14 per cent more than in the same period of 1919. This increase was accomplished with an increase of only one per cent in freight car mileage. The manager of the Ohio Region reports that freight forwarded has increased heavily, and that "this has resulted from the splendid co-operation on the part of the industries. The Lehigh Valley reports for the period from March 1 to July 22, an increase in the number of cars moved, of eight per cent, the total number this year being 1,246,743 cars. The New York Central reports for four months a movement of 3,011,076 cars, an increase over the corresponding period of last year of 100,467 cars.

The Association of Railway Executives and the American Railway Express Company have filed a petition with the Interstate Commerce Commission requesting approval of a proposed form of contract between rail carriers and the American Railway Express Company. By this contract it is proposed to divide the carriers into groups and to deal with and divide express transportation revenues and expenses by groups of carriers. The association feels that the public has a just right to expect orderly and efficient conduct of the express business, and that the only practicable means of securing this in the time remaining is to avail itself of the organization and facilities of the American Railway Express Company. The division of earnings will, the petition said, be in the interest of better service to the public, economy of operation, and will not unduly restrain competition.

The National Railway Service Corporation is the name of an organization incorporated under the laws of Maryland to fulfill an important function provided for under the new railroad law. This new company is headed by S. Davies Warfield, also president of the National Association of Owners of Railroad Securities, Baltimore, Md. The purpose of this company is to purchase, lease and sell locomotives, cars, equipment, materials and supplies used by the railroads and is recognized by the Interstate Commerce Commission as an agency to which it will make loans under the Esch-Cummins law to enable the corporation to provide additional funds needed by the railroads. Mr. Warfield has issued an explanation of the plan of operation, suggesting several different arrangements under which the railroads will be able to acquire or obtain the use of equipment through the aid of this corporation.

The American Association of Engineers has created a national railroad council consisting of George W. Hand, assistant to the president, C. & N. W., Chicago, chairman; W. W. K. Sparrow, assistant to the president, C. M. & St. P., Chicago; W. Evans, C. & A., Chicago; J. B. Latimer, signal engineer, C. B. & Q., Chicago; W. C. Bolin, valuation department, B. &. O., Chicago; F. C. Shepherd, principal assistant engineer, B. & M., Boston, Mass., S. H. Brenaman, Pennsylvania, Pittsburgh; A. H. Utter, C. B. & Q., Lines West, Lincoln, Neb., Harold Knight, regional engineer, Erie, Youngstown, Ohio; C. I. Long, N. Y. C., Lines West, Cleveland, Ohio; C. C. Berritt, Southern, Washington, D. C.; Lef Winship, assistant engineer, M. P., St. Louis, Mo.; J. E. Bebb, assistant bridge engineer, M. C., Detroit, Mich.; J. T. W. Jennings, assistant engineer, E. J. & E., Joliet, Ill.; H. I. Benjamin, S. P., San Francisco, Cal., and E. C. Huffman, principal assistant engineer, C. & N. W., Chicago.

PERSONAL MENTION

GENERAL

I. H. Schram, division engineer on the Erie, has been promoted to terminal superintendent, with headquarters at Marion, Ohio.

A. Leckie, division engineer on the Kansas City Southern, has been appointed industrial agent, with headquarters at Kansas City, Mo.

W. C. Barrett, division engineer on the Lehigh Valley at Sayre, Pa., has been appointed trainmaster of the Seneca division, with headquarters at the same place, succeeding **A. C. Kerrick,** transferred.

C. F. Urbutt, who was formerly district engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, and more recently trainmaster of the Sioux City and Dakota division, with headquarters at Sioux City, Ia., has been promoted to assistant superintendent of the Iowa and Dakota division, with headquarters at Mason City, Ia.

W. P. Critchfield, supervisor on the Pennsylvania with headquarters at Freeport, Pa., has been promoted to assistant trainmaster with headquarters at Pittsburgh, Pa. Mr. Critchfield was born in Bedford County, Pa., on August 3, 1880, and entered railway service on May 1, 1896, as a chainman in the construction department of the Pennsylvania at Camden, N. J., serving subsequently as a rodman and instrumentman until July, 1906, when he was promoted to assistant superviser on the West Pennsylvania division. In November, 1909, he was transferred to Harrisburg, Pa., where he served until November, 1912, when he was promoted to supervisor on the Allegheny division, being transferred in May, 1916, to the Conemaugh division, where he remained until his recent promotion to assistant trainmaster, as noted above.

ENGINEERING

G. K. Cooper has been appointed senior field engineer, Chicago Union Station, Chicago.

G. C. Pyle has been appointed chief engineer of the Arkansas & Louisiana Missouri (formerly the Arkansas & Louisiana Midland), with headquarters at Huttig, Ark.

A. W. Galbreath has been appointed valuation engineer of the Missouri, Kansas & Texas, with headquarters at Parsons, Kans. The position of chairman of the valuation committee has been abolished.

J. J. Ochs, assistant in the chief engineer's office of the Chicago & Alton, has been appointed office engineer with headquarters at Chicago, effective July 1, succeeding **J. E. Schwab,** who resigned to become city engineer of Alton, Ill.

J. M. Grant, who was pilot engineer on the Chicago & Alton during the period of government control, with headquarters at Springfield, Ill., has been re-assigned to his position as valuation engineer of the Chicago, Peoria, & St. Louis, with the same headquarters.

G. H. Ballantyne, division engineer of the Eastern division of the Western Pacific, with headquarters at Elko, Nev., has been transferred to the Western division, succeeding **T. L. Phillips,** resigned. **H. C. Maxon,** assistant division engineer, of the Eastern division, has been promoted to division engineer, in place of Mr. Ballantyne.

Lieutenant-Colonel J. G. Reid has been appointed chief engineer and superintendent in charge of maintenance and operation of the Edmonton, Dunvegan & British Columbia Railway, with headquarters at Edmonton, Alberta, Canada, succeeding **W. R. Smith.**

Thomas S. Bond, whose promotion to assistant chief engineer of the International & Great Northern, with headquarters at Palestine, Tex., was noted in last month's issue, was born on August 9, 1891, at Windsor, N. C. He received his education at the North Carolina State College of Agriculture and Engineering and entered railway service as an instrumentman with the National Railways of Mexico in June, 1910. In August, 1911, he was promoted to assistant resident engineer on the construction of lines from Durango, Mex., to Canitas, later being promoted to resident engineer on construction from Durango, Mex., to Llano Grande. In December, 1913, Mr. Bond was appointed resident engineer of the Texas-Mexican on valuation work and in September, 1915, became assistant engineer on the International & Great Northern, the position he held at the time of his recent promotion.

Meyer Hirschthal, whose promotion to concrete engineer of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., was announced in last month's issue of the *Railway Maintenance Engineer,* was born at Cracow, Poland, on December 12, 1879. In 1899, Mr. Hirschthal was graduated from the City College of New York and received the C. E. degree from Columbia University in 1902. He entered the employ of the Delaware, Lackawanna & Western in September, 1907, as designing draftsman in the concrete department, and was promoted to chief draftsman three years later. In 1915 he was appointed assistant engineer in the same department, from which position he was appointed concrete engineer in July, 1920.

Victor K. Hendricks, whose promotion to regional engineer, Southwestern region, Department of Liquidation Claims, United States Railroad Administration, with headquarters at St. Louis, Mo., was noted in last month's issue, was born at Indianapolis, Ind., on May 28, 1869. He graduated from Rose Polytechnic Institute in 1889 and entered the service of the Fairhaven & Southern in 1890 as a rodman, subsequently serving as draftsman and transitman. From 1892 to 1893, he served as assistant engineer on construction on the Bellingham Bay & Eastern, leaving this road in the latter year to become draftsman for the Lafayette Bridge Works. Mr. Hendricks was employed as engineer maintenance of way of the Logansport division of the Vandalia Railroad in January, 1894, and from June, 1902, to June, 1905, served as assistant to the engineer maintenance of way of the Baltimore & Ohio. On the latter date he was promoted to division engineer, which position he held until January, 1907, when he entered the service of the St. Louis-San Francisco as assistant engineer maintenance of way, later serving as office engineer, principal assistant engineer and assistant chief engineer. From July, 1918, until February, 1919, while Col. F. G. Jonah was in military service, Mr. Hendricks served as chief engineer of the St. Louis-San Francisco, his jurisdiction being extended later over the Missouri, Kansas & Texas. He was re-appointed assistant chief engineer of the St. Louis-San Francisco on Col. Jonah's return. Mr. Hendricks was appointed assistant engineer of the Southwestern region, Department of Liquidation Claims, United States Railroad Administration, in March, 1920, which position he held at the time of his recent promotion.

Victor K. Hendricks

Boynton S. Voorhees, whose appointment to position of general office engineer of the New York Central Lines, with headquarters at New York, was announced in the August issue of the *Railway Maintenance Engineer,* was born at Hackensack, N. J., on April 29, 1886, and was graduated from the Sheffield Scientific School of Yale University in 1907. He entered the employ of the New York, New Haven & Hartford the same year as a chainman at New Haven,

Conn., being made inspector in 1908. In the latter part of 1908 Mr. Voorhees left the New Haven and went with the New York Central as a chainman and rodman in the maintenance of way department, being located at Albany, N. Y. From April, 1909, to January, 1912, he was draftsman, transitman and inspector at Watertown, N. Y., in the construction department, being particularly in charge of field work of the new five-mile freight cut-off location and construction. In January, 1912, he was promoted to assistant engineer in the office of the district engineer of the construction department at Albany, and in May of the same year he was transferred to New York as assistant engineer of grade crossings. In 1916 he was promoted to engineer of this work and in February, 1920, was appointed district engineerd of the Eastern district at New York, remaining in this position until his recent promotion to general office engineer in July, as noted above.

W. E. Rivers has been appointed division engineer of the Kamloops division of the Pacific district of the Canadian National Railways, with headquarters at Kamloops Junction, B. C.

Ralph E. Patterson has been promoted to division engineer on the Mahanoy and Hazleton division of the Lehigh Valley, with headquarters at Hazleton, Pa., succeeding **G. A. Phillips,** who has been transferred.

H. C. Maxon, who has been promoted to division engineer on the Western Pacific, with headquarters at Elko, Nev., as noted above, was born at Edgerton, Wis., in 1883. He entered railway service with the Western Pacific in 1903 as a rodman, subsequently serving as levelman and transitman on preliminary surveys, location and construction. In 1909, he was promoted to instrumentman on construction, leaving this road in 1910 to go with the San Joaquin Light & Power Company as locating engineer. From 1912 until 1916, Mr. Maxon was engaged in general surveying in California, returning to the Western Pacific in the latter year as resident engineer on construction. He was promoted to assistant division engineer maintenance of way in 1918, which position he held until his recent promotion.

M. F. Steinberger, supervisor on the Baltimore & Ohio, with headquarters at Baltimore, Md., has been promoted to special engineer on the staff of the vice-president in charge of operation and maintenance with the same headquarters. Mr. Steinberger was born at Baltimore on March 30, 1887, and was graduated from the Polytechnic Institute in 1905. He entered railway service as an axeman in the engineering department of the Baltimore & Ohio in November of the same year and served subsequently as axeman, chainman, rodman and transitman, until July, 1910, when he was promoted to assistant engineer in the general manager's office at Baltimore. On October 1, 1911, he was promoted to overtime inspector and later to chief of the joint and special facilities bureau, remaining in this position until August 1, 1915, when he became supervisor on standard costs and outside operations. In March, 1917, he was made lighterage agent at New York and in September, 1918, he was promoted to assistant manager of the department of personnel, serving in this capacity until March 1, 1919, when he was appointed supervisor of terminal operations with headquarters at Baltimore, where he remained until his recent promotion to special engineer, as noted above.

R. F. Nicholson, transitman on the Grand Trunk, with headquarters at Portland, Me., has been promoted to assistant engineer with the same headquarters. Mr. Nicholson was born at London, England, on July 2, 1892, and was educated at the London Polytechnic College. He entered railway service in August, 1911, as a rodman on the Canadian Pacific at Vancouver, British Columbia. He later went with the Esquimalt Nanaimo Railway as a rodman and with the Pacific Great Eastern as a draftsman. In 1914 he left the railway service to return in 1918 when he was appointed transitman on the Grand Trunk remaining in this position until his recent promotion to assistant engineer.

Francis J. Meyer, whose promotion to assistant engineer on the New York, Ontario & Western, with headquarters at Middletown, N. Y., was announced in last month's issue, was born in Brooklyn, N. Y., on August 18, 1884. Mr. Meyer completed his technical training at New York University, evening sessions, during 1900 to 1906, while being employed as a general assistant rodman by a contracting firm in New York City. On February 1, 1906, he entered the employ of the New York, Ontario & Western in the drafting room and in 1907 became chainman at Middletown, N. Y., serving subsequently as rodman at Carbondale, Pa., from 1908 to 1909, and as levelman at the same place until 1910, when he was promoted to transitman. In 1911 he was promoted to supervisor of the Port Jervis & Kingston division, with headquarters at Kingston, N. Y., and in 1914 he was promoted to roadmaster, with headquarters at Walton, N. Y., where he remained until his recent promotion to assistant engineer, as noted above.

TRACK

M. A. H. Scull has been promoted to assistant supervisor of track on the Central of New Jersey, with headquarters at Jersey City, N. J.

P. E. Ralston has been appointed acting roadmaster on the Los Angeles & Salt Lake, with headquarters at Milford, Utah, succeeding **C. J. Adams,** transferred.

Thomas Brown has been appointed roadmaster of the Gila district of the Tucson division of the Southern Pacific, with headquarters at Gila, Ariz., succeeding **C. M. Kipp,** who has resigned.

D. S. Westfall, section foreman on the Baltimore & Ohio, who was promoted to track supervisor, with headquarters at Gassaway, W. Va., as noted in last month's issue, was born on September 17, 1873, and entered railway service with the Pittsburgh & West Virginia as a track laborer in 1890. Four years later he was promoted to section foreman at Hampton, W. Va., and continued in this capacity until his recent promotion, except for various periods when he was

W. A. Todd, general roadmaster of the Charleston & Western Carolina, with headquarters at Augusta, Ga., has resigned to become manager of the Georgia-Carolina Gravel Company at Augusta. Mr. Todd was born at Laurens, S. C., in 1876 and entered railway service in 1895 as a laborer on a bridge gang of the Port Royal & Western Carolina, now the Charleston & Western Carolina. He served in this capacity and as a relief foreman until 1900, when he was promoted to foreman on bridge and construction work. In 1902 he was promoted to roadmaster at Laurens, where he remained until 1912, when he was promoted to general roadmaster at Augusta. In 1917 he was given the additional duties of trainmaster and from this time up to his recent resignation to go into business he continued to serve as trainmaster and general roadmaster of the Charleston & Western Carolina.

Joseph W. Gohl has been appointed supervisor in the maintenance of way department of the Philadelphia & Reading at Shamokin, Pa., succeeding **A. S. Shaw.**

I. B. Clontz, supervisor of track on the Southern Lines, with headquarters at Rock Hill, S. C., has been promoted to roadmaster, with headquarters at Charleston, S. C., succeeding **N. J. Hammond,** granted a leave of absence on account of ill health.

P. W. Miller, assistant general roadmaster on the Charleston & Western Carolina, with headquarters at Augusta, Ga., has been promoted to general roadmaster, with the same headquarters, suceeding **W. A. Todd,** who has resigned. Mr. Miller was born at Pickens, S. C., on December 5, 1882, and entered railway service with the Charleston & Western Carolina as a section laborer in July, 1900. He was promoted to section foreman in February, 1908, and served subsequently as a section, yard and extra gang foreman until July 27, 1914, when he was promoted to division roadmaster. On March 1, 1920, he was promoted to assistant general roadmaster, remaining in this position until his recent promotion, as noted above.

Todd L. Hofmeister, whose promotion to supervisor on the Pennsylvania, with headquarters at Dover, Ohio, is noted elsewhere, was born at North Beaver, Pa., on November 8, 1883. He entered railway service as a trackman on the Pennsylvania in November, 1899, and on April 1, 1901, left

this road to go as a trackman on the Pittsburgh & Lake Erie, where he was promoted to assistant track foreman on July 1, 1902. In October, 1902, he returned to the employ of the Pennsylvania as an extra-gang foreman and later as a section foreman at Edenburg. He was subsequently transferred to Lowellville, Ohio, and in November, 1906, he left railway service. In July, 1907, he returned to the Pennsylvania as a section foreman and from 1907 to February 1, 1917, he served continuously in the capacity of section and extra-gang foreman, being promoted on the latter date to general foreman at Edenburg. He remained in this position until his recent promotion to supervisor, as noted above.

George H. Doxrud, whose promotion to supervisor on the Pennsylvania, with headquarters at New Bethlehem, Pa., is noted elsewhere in these columns, was born at Antwerp, Belgium, on April 22, 1880, and was graduated from the University of Pennsylvania in 1911. He entered the employ of the Pennsylvania in July of the same year as a rodman in the division engineer's office at West Philadelphia and served in various capacities until September 28, 1918, when he was promoted to assistant supervisor in the office of the engineer maintenance of way at Philadelphia. He was later transferred to the New York division, where he remained until promoted to supervisor at New Bethlehem.

A. Mitguard, who has been promoted to division roadmaster of the Montana division of the Great Northern, with headquarters at Wolf Point, Mont., as noted in last month's issue, was born in Norway on March 2, 1884. He entered the service of the Northern Pacific on July 26, 1903, as a section and extra gang foreman on the Montana division, being transferred on January 1, 1907, to the Spokane division as extra gang foreman. He left this road on June 8, 1908, to go with the Great Northern as an extra gang foreman on the Marcus division, which position he held until December 2, 1908, when he was promoted to district roadmaster, the position he held at the time of his recent promotion.

Bluford B. Violett, who has been appointed general roadmaster of the Ft. Worth & Denver City, with headquarters at Ft. Worth, Tex., as noted in last month's issue, was born at Winchester, Ill., on December 24, 1861. He entered railway service with the Chicago, Burlington & Quincy as a section laborer on October 1, 1880, later being promoted to section foreman. In 1884 he was promoted to extra gang foreman and from March 1 1904, until 1915, he served as roadmaster on the Beardstown division, in the latter year being transferred to the Galesburg division. Some time later he was returned to the Beardstown division and in 1919 was appointed general roadmaster of this division, which position he held at the time of his recent appointment.

Bluford B. Violett

Charles G. Grove, whose promotion to supervisor on the Monongahela division of the Pennsylvania is noted elsewhere, was born at Muddy Creek Forks, Pa., on December 20, 1890, and was graduated from the Pennsylvania State College in 1912. He entered railway service as a rodman in the construction department of the Pennsylvania in September, 1912, transferring in September, 1913, to the maintenance of way department, where he served as rodman until October 18, 1916, when he was promoted to transitman at Philadelphia, Pa. On May 16, 1917, he was promoted to assistant supervisor at Elmira, N. Y., and later transferred to Dunkirk, N. Y., where he remained until 1917, when he entered the military service of the United States. On discharge in October, 1919, he returned to the Pennsylvania as an assistant supervisor on the Monongahela division, where he remained until his promotion to supervisor with headquarters at Monongahela City, Pa.

T. L. Hofmeister, general foreman on the Pennsylvania, has been promoted to supervisor, with headquarters at Dover, Ohio. **G. H. Doxrud,** assistant supervisor at Trenton, N. J., has been promoted to supervisor at New Bethlehem, Pa. **J. L. Conover,** assistant supervisor, has been promoted to supervisor, with headquarters at Uniontown, Pa., succeeding **W. W. Portser,** transferred to Kittanning, Pa. Mr. Portser succeeds **S. H. Kuhn,** who was transferred to Burgettstown, Pa. **C. G. Grove,** assistant supervisor, has been promoted to supervisor at Monongahela City. **M. J. Jones,** supervisor in the valuation department, has been transferred as supervisor to the Allegheny division, with headquarters at Du Bois, Pa., succeeding **B. M. Frymire,** who has been transferred to Freeport, Pa., vice **W. P. Critchfield,** promoted. **J. Bartelstone,** assistant supervisor at Huntingdon, Pa., has been promoted to supervisor at Osceola Mills, succeeding **R. J. Colgan,** transferred to Columbia in place of **A. M. Williams,** deceased.

D. Sullivan has been appointed roadmaster on the Sioux City division of the Great Northern, with headquarters at Sioux City, Iowa, succeeding **J. S. Breit,** assigned to other duties. **M. H. Williams** has been appointed roadmaster on the Sioux City division, with headquarters at Garretson, S. D., in place of **T. J. Cherpeske,** assigned to other duties. **F. Kubitza** has been appointed roadmaster on the Montana division, with headquarters at Williston, N. D., vice **A. Mitguard,** promoted, as noted in last month's issue. **L. Larson** has been appointed roadmaster on the Montana division, with headquarters at Wolf Point, Mont., succeeding **George Anderson,** who has been granted 90 days' leave of absence. **R. S. Kniffen,** division roadmaster of the Havre division, with headquarters at Havre, Mont., has been transferred to the Superior-Mesabi division, with headquarters at Superior, Wis., succeeding **F. A. Larson,** who has been appointed roadmaster on the Kalispell division, with headquarters at Rexford, Mont. Mr. Larson replaces **Nels Hovind,** assigned to other duties. **S. Roper,** roadmaster on the Marcus division, with headquarters at Marcus, Wash., has been promoted to division roadmaster, with headquarters at Havre, Mont., succeeding Mr. Kniffen, and **J. B. Clapp,** roadmaster on the Marcus division, with headquarters at Northport, Wash., has been transferred to succeed Mr. Roper. **H. D. Brown,** roadmaster on the Marcus division, has been transferred to succeed Mr. Clapp, and **Harry Coulton,** roadmaster, with headquarters at Oroville, Wash., has been transferred to Mr. Brown's position. **J. Campbell,** roadmaster on the Cascade division, with headquarters at Blaine, Wash., has been transferred to the Havre division, with headquarters at Great Falls, Mont., to succeed **Harry Petry,** assigned to other duties. **R. Hughes** has been appointed to succeed Mr. Campbell.

BRIDGE

A. F. Ainslie has been appointed assistant supervisor of bridges and buildings on the Northern Pacific, with headquarters at Duluth, Minn.

Thomas W. Simmons, carpenter foreman on the Wheeling division of the Pennsylvania, has been promoted to master carpenter, with headquarters at Wheeling, W. Va.

D. T. Rintoul has been appointed assistant general bridge inspector on the Southern Pacific, with headquarters at San Francisco, succeeding **Harry Pollard,** promoted as noted in last month's issue.

Dan W. Roberts, division storekeeper on the Union Pacific, with headquarters at Kansas City, Mo., has been appointed general storekeeper on the Pere Marquette, with headquarters at Detroit, Mich.

Edwin C. Neville, whose promotion to supervisor of bridges and buildings on the Grand Trunk, with headquarters at Allendale, Ontario, was noted in last month's issue, was born at St. Thomas, Ont., in June, 1876, and entered railway service in April, 1909, as a masonry foreman on the Michigan Central at St. Thomas. In February, 1911, he began work with the Grand Trunk as a masonry foreman on the grade

separation work at Toronto, continuing in this capacity until 1917, when he was promoted to general foreman, bridges and buildings. He held this position until his appointment to supervisor, as mentioned above.

J. E. Rosenbalm, general foreman of bridges, buildings and water service on the Eastern division of the St. Louis-San Francisco, with headquarters at Springfield, Mo., has been appointed to a similar position on the Texas lines of that road, with headquarters at Fort Worth, Tex.

Harry Clayton Swartz, whose appointment as superintendent of buildings and bridges of the Grand Trunk, with headquarters at Montreal, was announced in the August issue of the *Railway Maintenance Engineer,* was born in May, 1867, at Jerseyville, Ont., Canada, and attended the public schools of that town. In 1885 he entered the employ of the Grand Trunk and has remained with that company continuously for 35 years, serving successively as foreman in the bridge and building department at Niagara Falls, Ont., and London, Ont., as supervisor in the same department at London, Ont., until 1910, when he was promoted to master of bridges and buildings at St. Thomas, Ont., where he remained until his recent promotion to superintendent of bridges and buildings, as noted above.

William H. Tool, whose promotion to master of bridges and buildings on the Grand Trunk was noted in the August issue of the *Railway Maintenance Engineer,* was born at Pickering, Ont., Canada, and entered railway service with the Grand Trunk in June, 1898. In 1904 he was promoted to foreman of bridges and buildings and in 1908 to bridge inspector, serving in this capacity until in 1913, when he was promoted to supervisor of bridges and buildings at Allandale, Ont., where he remained until his recent promotion to master of bridges and buildings, with headquarters at St. Thomas, Ont.

OBITUARY

R. L. Hatfield, formerly roadmaster of the McAlester division of the Missouri, Kansas & Texas, and president of the Stringtown Crushed Rock Company, was instantly killed on July 28, in a construction accident. Mr. Hatfield had been roadmaster on the Missouri, Kansas & Texas for 16 years.

Isham Randolph, at one time chief engineer of the Chicago & Western Indiana, died at his home in Chicago recently at the age of 72 years. Mr. Randolph's first railway work was with the Winchester & Strasburg as an axman. He entered the service of the Baltimore & Ohio in 1872, serving in the employ of this road until 1880, when he was appointed chief engineer of the Chicago & Western Indiana. In 1888 he established himself in Chicago as a civil engineer in general practice. On June 7, 1893, he was appointed chief engineer of the Sanitary District of Chicago, in which capacity he directed the building of the Chicago drainage canal. He occupied this position until 1907, when he resigned, continuing his connection with this project, however as consulting engineer. From 1905 to 1906, he was a member of the international board of consulting engineers of the Panama Canal Commission.

Nathaniel F. Thompson, district engineer in the engineering department of the Western district of the New York Central Lines, with headquarters at Buffalo, N. Y., died on July 26, at Roswell, N. M., where he had gone because of chronic throat trouble. Mr. Thompson was born at Lansingburgh, N. Y., on October 16, 1884, and was graduated from Rensselaer Polytechnic Institute in 1907 with the degree of civil engineer. Soon after graduation he entered the service of the New York Central as a draftsman in the engineering department at New York and was promoted to assistant engineer of grade crossings within a short time. In 1912 he was promoted to engineer of grade crossings. In March, 1917, he was promoted to district engineer of the Middle district, with headquarters at Albany, N. Y., being transferred in January, 1918, to the territory of the Western district, with headquarters at Buffalo, where he remained until forced to leave on account of the illness mentioned.

CONSTRUCTION NEWS

Additional Recommendations to the Interstate Commerce Commission by the special committee of the Association of Railway Executives includes the following new items under the head of "additions and betterments which will definitely promote the movement of cars."

Ann Arbor		$275,000
	Terminal facilities, extensions to existing side tracks, turn table.	
Baltimore & Ohio		5,000,000
	Additional main tracks, yard tracks, sidings, interlockers, telephone train despatching, shop machinery, bridges, trestles, culverts, heavier rail.	
Boston & Maine		2,188,564
	Retaining walls and rip rapping, renewal of bridges, automatic signals, extension to sidings, interlockers, improved water supply, engine house and yard facilities.	
Chicago & Eastern Illinois		502,060
	Shop machinery, improvements to trestles.	
Chicago Junction		1,100,000
	Yards and car shop.	
Chicago, Milwaukee & St. Paul		4,940,000
	Ballast, rail, bridges, yard tracks, and sidings, fuel stations, water stations, shop buildings, shop machinery and tools, track elevation.	
Chicago, Rock Island & Pacific		5,000,000
	Additional yard tracks and sidings, shop machinery and tools, ballast, bank widening rails, bridges.	
Evansville, Indianapolis & Terre Haute		200,000
	Bridges, rails, ties, ballast.	
Gulf, Mobile & Northern		72,000
	Ballasting.	
International & Great Northern		40,000
	For 90-lb. rail.	
Louisiana & Arkansas		165,660
	Tools, shop extension, tie plates, yard and passing tracks, heavier rail.	
Louisville & Jefferson Bridge		162,574
	Additional yard tracks, coaling station, water station, ash pit, heavier rail and bin.	
Maine Central		533,132
	Heavier rails, ballast, shops, shop machinery and renewal of bridges.	
Missouri Pacific		2,843,179
	Rails, bridges, trestles, additional yard tracks, signals and interlockers, telegraph and telephone lines, fuel and water stations, shop buildings, engine houses, shop machinery, tools, wharves, and docks.	
New York Central Lines		12,101,928
	allocated as follows:	
	New York Central (including Boston & Albany) Railroad	$5,500,000
	Engine terminals and facilities, freight yards and yard facilities, sidings and extensions, interlockers, shop machinery, and miscellaneous betterments.	
	Michigan Central	613,221
	Passing tracks, repair tracks, storage tracks, yard tracks, and engine terminals.	
	Rutland Railroad	61,198
	Bridges, rebuilding swinging bridge at Fort Ticonderoga.	
	Indiana Harbor Belt	526,400
	Round house, tools, yard tracks and passing tracks.	
	Cleveland, Cincinnati, Chicago & St. Louis	4,506,101
	Double tracking, passing and storage tracks, shop tools, machinery and signals.	
	Zanesville & Western	60,100
	Engine terminal and yard tracks.	
	Kanawha & Michigan	231,204
	Passing sidings and cutoff.	
	Lake Erie & Western	242,700
	Passing tracks, interlockers, shop machinery and tools, engine house stalls.	

Toledo & Ohio Central	214,454
Yard tracks, passing tracks, yard facilities, shop tools and machinery.	
Cincinnati Northern	92,550
Passing tracks, interlockers, tools.	
Pennsylvania System	6,780,125
Grain elevator, engine house facilities, yard tracks, shops.	
Seaboard Air Line	750,000
Ballasting, trestles, rail renewals, dredging, shop machinery facilities, water facilities, passing and yard tracks.	
Tampa Northern	57,000
Heavier rails and additional tracks.	
Wabash	191,225
Strengthening of Bridges for heavier power.	

The Boston & Maine has awarded a contract to W. H. Pike & Sons, Lawrence, Mass., for the construction of a concrete bridge at Holden, Mass., to cost $33,000. It has also awarded a contract to J. W. Buswell, Salisbury, Mass., for the erection of a bridge at Orleans, Vermont, to cost about $25,000. Another contract was awarded to the Tredennick Company, Boston, Mass., for the building of a two-story brick and steel freight station in Boston, 62 ft. by 115 ft. in area, with concrete foundation, at an approximate cost of $50,000.

The Big South Fork Railroad has applied to the Interstate Commerce Commission for a certificate authorizing it to build a line in Scott County, Tenn., for a distance of 14 miles from a point on the Oneida & Western at or near where it crosses the Big South fork of the Cumberland river.

The Central of Georgia has awarded a contract to the George B. Swift Company, Chicago, to build a 20-stall roundhouse of reinforced concrete and brick construction, and a machine shop at Columbus, Ga. The cost of the improvements will be about $500,000.

The Chesapeake & Ohio will establish an assembling yard at Whitesville, W. Va., with a capacity of 500 cars.

The Chicago & North Western has let contracts to the Ogle Construction Company, Chicago, for a 350-ton coaling station of the balanced bucket type, to be erected at Clinton, Iowa, and one of 300 tons capacity to be built at Carroll, Iowa.

Chicago & Western Indiana has obtained approval from the Interstate Commerce Commission for a loan to this company of $8,000,000, of which $2,000,000 is to be used for additions and betterments. These include improvements at the power house at Forty-eighth street, Chicago, $165,000; the installation of automatic block signals between Fifteenth and Eighty-first streets, Chicago, $191,000; the completion of elevated yard along Canal street between Twenty-third and Twenty-ninth streets, Chicago, $933,000, and the construction of a new yard in the vicinity of the Chicago Drainage Canal for the Belt Railway of Chicago, $300,000.

The Chicago, Burlington & Quincy has let a contract to G. A. Johnson & Son, Chicago, to build a 16-stall roundhouse, coal pocket, clinker pit, a washout sump, and wash and locker rooms at Galesburg, Ill. Contracts for the building of passenger stations at Mound City, Mo., and Kirksville have been awarded to T. S. Leake & Co., Chicago.

The Chicago Great Western has obtained approval from the Interstate Commerce Commission for a loan from the $300,000,000 fund provided by the transportation act to assist the road in financing the construction of additional yard tracks at or near Oelwein, Ia., at a cost of $120,000, the installation of additional shop and roundhouse equipment at Oelwein and larger turntables at Chicago and Des Moines at a cost of $181,000.

The Chicago, Milwaukee & St. Paul has let contracts to the Ogle Construction Company, Chicago, to build a 160 ton coaling station at Dubuque, Iowa; a 200 ton coaling station at Corliss, Wis.; and a 200 ton coaling station at Davis Junction, Ill.

The Chicago, Rock Island & Pacific has awarded a contract to J. E. Nelson & Sons, Chicago, for the construction of a three-story, reinforced concrete and brick office building on Sixty-third street, Chicago, to cost approximately $100,000.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded a contract to the American Bridge Company for 300 tons of structural materials.

The Colorado & Southern has let contracts to the Ogle Construction Company, Chicago, to build a 150 ton coaling station at Walseburg, Col., and a 50 ton coaling station at Boulder Junction, Col.

The Delaware & Hudson has obtained approval from the Interstate Commerce Commission for a loan to assist in financing the elimination of the Whitehall tunnel at a cost of $500,000 and a new yard at Glenville, at a cost of $1,250,000 and one at Port Henry, at a cost of $500,000.

The Fort Worth & Denver City has given a contract to the Ogle Construction Company, Chicago, to build a 150 ton coaling station at Dalhart, Tex.

The Great Northern will receive a loan of $900,000 through certificate from the Interstate Commerce Commission to supplement a similar amount to be financed otherwise by the railroad, this money to be used for additions and betterments which are divided as follows: For strengthening existing equipment, $200,000; for fencing right of way, $100,000; for cottages for housing employees at Whitefish, Mont., $100,000; for car repair sheds in North Dakota, $400,000; for additional yard tracks at Allouez, Wis., Hillyard, Wash., and other miscellaneous passing and station tracks, $600,000; for additional or improved water supply at Devon, Mont., and miscellaneous use, $100,000; for shop buildings and tools at Whitefish, Mont., engine terminal, and elsewhere, $300,000.

The Michigan Northern has applied to the Interstate Commerce Commission for a certificate of public convenience and necessity for an extension from Lansing to Midland and Mount Pleasant, Mich.

The Missouri, Kansas & Texas has awarded a contract to the Roberts & Schaefer Company, Chicago, for a 300-ton, two-track, reinforced concrete, automatic electric locomotive coaling and sanding plant, for installation at Oklahoma City, Okla.

The New York, New Haven & Hartford has awarded a contract to the Boston Bridge Works for two bridges in Massachusetts, involving 200 tons of structural material.

The Norfolk & Western is planning to increase its roundhouse facilities at Bristol, Tenn., and also at Shenandoah, Va.

The Pennsylvania System will make improvements in the yards at Conway, Pa., which will increase the capacity for receiving and classifying freight 50 per cent. The work will involve an expenditure of $500,000.

The Pere Marquette has closed a contract with the Roberts & Schaefer Company, Chicago, for a 500-ton, three-track, reinforced concrete, automatic electric locomotive coaling and sanding plant, for installation at Saginaw, Mich. This road has applied to the Interstate Commerce Commission for permission to dismantle 11.47 miles of main line and 2½ miles of siding between Rapid City and Kalkaska, Mich., which were built to serve a lumber operation that ceased some years ago.

The Richmond, Fredericksburg & Potomac will erect a viaduct over McKenzie street, Richmond, Va.

The Texas & Pacific has retained the Strauss Bascule Bridge Company, Chicago, to design a 145-ft. single-leaf, double-track railroad bridge to be built over Bayou Plaquemine at Plaquemine, La. The bridge will be a Strauss heel-trunnion bascule.

The Western Maryland has applied to the Interstate Commerce Commission for a loan to assist it in financing the construction of additional passing sidings at a cost of $27,800, an engine terminal and yards at Bowest, Pa., at a cost of $100,000, dredging at Port Covington, Baltimore, at a cost of $95,000 and an enlargement and extension of the coal pier at Baltimore at a cost of $400,000.

SUPPLY TRADE NEWS

GENERAL

The Oxweld Acetylene Company, New York, has established Pacific Coast sales and distributing headquarters at San Francisco, with offices at 1077 Mission street. Additional sales representatives' offices are maintained at Los Angeles, Salt Lake City, Portland and Seattle. **Leo Romney** is Pacific sales manager, with headquarters at San Francisco. The territory embraces Washington, Oregon, Idaho, Utah, Arizona, California, Nevada and a portion of Wyoming.

PERSONAL

Exum M. Haas has been appointed manager of the railroad department of the H. K. Ferguson Company, Cleveland, Ohio. Mr. Haas graduated from Purdue University in 1905 and for the following eight years was actively engaged in railroad maintenance and construction. From 1912 to 1917, he was western editor of the Electric Railway Journal, and during the following three years he was sales engineer of the Austin Company, Cleveland, O.

Harvey W. Cutshall, supervisor of gas engines and special equipment on the St. Louis-San Francisco, has been appointed general manager of Mudge & Co. in charge of engineering and manufacturing. Mr. Cutshall was born at Maddensville, Pa. on January 23, 1876. From 1893 to 1896, he was employed on the Chicago, Rock Island & Pacific as an assistant agent and operator on the West Iowa division. Later he was engaged in the electrical contracting business and for a time was with the McCormick Harvesting Machine Company. In 1904 he was appointed superintendent of telegraph and signal engineer of the El Paso & Southwestern, a position he held until 1911. Two years later he was placed in charge of the service department of the Hudson Automobile Agency at Springfield, Mo. and four years later he was appointed to the position he held at the time of his recent appointment.

Harvey W. Cutshall

James T. Lee has been appointed to the sales engineering staff of the Southwark Foundry & Machine Company, Philadelphia, Pa. Mr. Lee for several years past was vice-president in charge of sales of the Hanna Engineering Works, Chicago. It is the purpose of the Southwark Foundry & Machine Company to broaden its field of activity greatly by adding a line of pneumatic and hydro-pneumatic riveters to its present line of hydraulic and power machinery.

E. Coleman, manager of the railroad ditcher, log loader and crane departments of the American Hoist & Derrick Company, St. Paul, Minn., has resigned to become sales engineer with Landes & Co., manufacturers' agents at Salt Lake City, Utah. Mr. Coleman has been connected with the American Hoist & Derrick Company for 13 years, during the first three years of which he was located at Spokane, Wash., after which he was promoted to the position which he held at the time of his resignation.

Walter E. Miller will engage in private practice as a civil engineer, giving attention to investigations and studies of steam and electric railways and public utility problems, especially the valuation of such properties, ratemaking therefor, reports of efficiency of operation, designing, estimating and supervising construction of new properties and improvements of existing plants. Temporarily his headquarters will be in the Pioneer Block, Madison, Wis.

TRADE PUBLICATIONS

Timber Preservation—The Allis-Chalmers Manufacturing Company has reprinted its bulletin No. 1439-B which was issued originally in October, 1916, containing detailed information concerning the treatment of timber by the various processes and describing the equipment which it makes for that purpose.

Oak Floors.—Two booklets have been issued by the Oak Flooring Manufacturers' Association, Chicago. The larger of the two, 24-pages, contains a general exposition of this material with particular application to its use in various classes of buildings. The smaller booklet contains 15 pages of specifications and instructions for laying and finishing the floors.

Twin City Engines.—The Minneapolis Steel & Machinery Co., Minneapolis, Minn., has recently issued a 48-page illustrated bulletin, which is devoted to the line of internal combustion, heavy-duty motors manufactured by this company. The pages contain a full description of the methods of construction and utilization of these motors, while the illustrations include photographs, drawings and power curves of the motor and of actual installations where the motors are driving hoists, pumping units, ditch diggers and dragline excavators, etc.

MATERIALS AND EQUIPMENT

The Arkansas & Louisiana has applied to the Interstate Commerce Commission for authority to issue equipment trust notes to the amount of $220,000 to be used in the purchase of equipment including a steam wrecker, ditcher and steam bucket crane.

The Chicago, Burlington & Quincy has reserved space with the Colorado Fuel & Iron Company for 20,000 tons of rails, and at Chicago for 25,000 tons. It is also in the market for 5,500 tons of tie plates.

The Pennsylvania System, Southwestern and Northwestern regions, is making inquiry for 5,000 tons of tie plates and the Central region for 1,500 tons.

The Wheeling & Lake Erie is making inquiries for 2,500 tons of rails.

A STUDY OF "SNOW-BURNT" RAIL

The chief of the Bureau of Safety of the Interstate Commerce Commission has just issued a report of an investigation of the derailment of a passenger train on the St. Louis-San Francisco Railroad near Keighley, Kan., on December 26, 1918, which was caused by the breaking of opposite rails which had been "snow-burnt" apparently caused by an engine slipping on account of being stalled in the snow. In view of the frequency with which wheel-burnt rails are found in service, a study of the effects of such burning has been undertaken by the Commission. The report summarizes the present situation with the statement that "The suggestion that wheel-burnt rails be removed from the track indiscriminately as a menace to safety would not appear justifiable in view of the inadequacy of the data upon their condition and the large number of such rails which are carrying present equipment without rupture. They are due to a condition so common that avoidance of their formation would likewise appear an impracticable demand." The report further states that "the means of distinguishing between safe and unsafe rails of this type unfortunately has not been made known" and that further investigations of the same problem are now in progress with rails involved in another derailment.